**Dimensions of Learning**

**Dimension 3, Bloom and Encouraging Higher Order Thinking**

**Thinking About Thinking and Teaching Thinking**

* What is the difference between lower order thinking and higher order thinking?
* What does this look like in your classroom?
* What is hard about getting students to engage in higher order thinking?

**TASK**: Select two outcomes (and associated indicators or equivalent) from the NTCF. Identify the elements of the outcome (and indicator) that require the demonstration of ‘acquired/integrated knowledge’ (Dim 2) and separately identify the elements of the outcome that require the demonstration of the higher order ‘extended/refined knowledge’ (Dimension 3).

* What’s hard about the task above?
* Based on what you already know about Bloom’s Taxonomy or Dimension 3, how could each provide you with strategies to help you to teach higher order thinking?

**A Quick Ramble Through Bloom**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Knowledge**  **dimension** | **Cognitive dimension** | | | | | |
| **1. Remember** | **2. Understand** | **3. Apply** | **4. Analyse** | **5. Evaluate** | **6. Create** |
| A. Factual knowledge |  |  |  |  |  |  |
| B. Conceptual knowledge |  |  |  |  |  |  |
| C. Procedural knowledge |  |  |  |  |  |  |
| D. Meta knowledge |  |  |  |  |  |  |

How might you use the tables below . . .

a) when preparing lesson or classroom materials?

b) when preparing assessment task sheets?

c) when planning a unit of work?

d) when planning a lesson?

e) during a lesson?

**Remember**

|  |  |  |
| --- | --- | --- |
| **Useful Verbs** | **Sample Question Stems** | **Potential activities and products** |
| tell list describe relate locate write find state name | What happened after...? How many...? Who was it that...? Can you name the...? Describe what happened at...? Who spoke to...? Can you tell why...? Find the meaning of...? What is...? Which is true or false...? | Make a list of the main events.. Make a timeline of events. Make a facts chart. Write a list of any pieces of information you can remember.  List all the .... in the story. Make a chart showing... Make an acrostic. Recite a poem. |

**Understand**

|  |  |  |
| --- | --- | --- |
| Useful Verbs | Sample Question Stems | Potential activities and products |
| explain interpret outline discuss distinguish predict restate translate compare describe | Can you write in your own words...? Can you write a brief outline...? What do you think could have happened next...? Who do you think...? What was the main idea...? Who was the key character...? Can you distinguish between...? What differences exist between...? Can you provide an example of what you mean...? Can you provide a definition for...? | Cut out or draw pictures to show a particular event. Illustrate what you think the main idea was. Make a cartoon strip showing the sequence of events. Write and perform a play based on the story. Retell the story in your words. Paint a picture of some aspect you like. Write a summary report of an event. Prepare a flow chart to illustrate the sequence of events. Make a colouring book. |

**Apply**

|  |  |  |  |
| --- | --- | --- | --- |
| Useful Verbs | Sample Question Stems | | Potential activities and products |
| solve show use illustrate construct complete examine classify | Do you know another instance where...? Could this have happened in...? Can you group by characteristics such as...? What factors would you change if...? Can you apply the method used to some experience of your own...? What questions would you ask of...? From the information given, can you develop a set of instructions about...? Would this information be useful if you had a ...? | Construct a model to demonstrate how it will work. Make a diorama to illustrate an important event. Make a scrapbook about the areas of study. Make a paper-mache map to include relevant information about an event. Take a collection of photographs to demonstrate a particular point. Make up a puzzle game suing the ideas from the study area. Make a clay model of an item in the material. Design a market strategy for your product using a known strategy as a model. Dress a doll in national costume. Paint a mural using the same materials. Write a textbook about... for others. | |

**Analyse**

|  |  |  |
| --- | --- | --- |
| Useful Verbs | Sample Question Stems | Potential activities and products |
| analyse distinguish examine compare contrast investigate categorise identify explain separate advertise | Which events could have happened...? I ... happened, what might the ending have been? How was this similar to...? What was the underlying theme of...? What do you see as other possible outcomes? Why did ... changes occur? Can you compare your ... with that presented in...? Can you explain what must have happened when...? How is ... similar to ...? What are some of the problems of...? Can you distinguish between...? What were some of the motives behind...? What was the turning point in the game? What was the problem with...? | Design a questionnaire to gather information. Write a commercial to sell a new product. Conduct an investigation to produce information to support a view. Make a flow chart to show the critical stages. Construct a graph to illustrate selected information. Make a jigsaw puzzle. Make a family tree showing relationships. Put on a play about the study area. Write a biography of the study person. Prepare a report about the area of study. Arrange a party. Make all the arrangements and record the steps needed. Review a work of art in terms of form, colour and texture. |

**Create**

|  |  |  |
| --- | --- | --- |
| Useful Verbs | Sample Question Stems | Potential activities and products |
| create invent compose predict plan construct design imagine propose devise formulate | Can you design a ... to ...? Why not compose a song about...? Can you see a possible solution to...? If you had access to all resources how would you deal with...? Why don't you devise your own way to deal with...? What would happen if...? How many ways can you...? Can you create new and unusual uses for...? Can you write a new recipe for a tasty dish? can you develop a proposal which would... | Invent a machine to do a specific task. Design a building to house your study. Create a new product. Give it a name and plan a marketing campaign. Write about your feelings in relation to... Write a TV show, play, puppet show, role play, song or pantomime about...? Design a record, book, or magazine cover for...? Make up a new language code and write material suing it. Sell an idea. Devise a way to... Compose a rhythm or put new words to a known melody. |

**Evaluate**

|  |  |  |
| --- | --- | --- |
| Useful Verbs | Sample Question Stems | Potential activities and products |
| judge select choose decide justify debate verify argue recommend assess discuss rate prioritise determine | Is there a better solution to... Judge the value of... Can you defend your position about...? Do you think ... is a good or a bad thing? How would you have handled...? What changes to ... would you recommend? Do you believe? Are you a ... person? How would you feel if...? How effective are...? What do you think about...? | Prepare a list of criteria to judge a ... show. Indicate priority and ratings. Conduct a debate about an issue of special interest. Make a booklet about 5 rules you see as important. Convince others. Form a panel to discuss views, eg "Learning at School." Write a letter to ... advising on changes needed at... Write a half yearly report. Prepare a case to present your view about... |

<http://www.teachers.ash.org.au/researchskills/dalton.htm>

**What does Dimension 3 offer that Bloom doesn’t?**

This is Marzano: ‘It is not sufficient to simply ask students questions or give them assignments that require these (higher order) types of reasoning processes; educators need to directly teach the processes.’

How does the above quote help you answer the heading question?

**1. COMPARING**

**What is it?** describing how things are the same and different

**What does it do?** it influences our perceptions of the world: we might discover new things we didn’t see before comparing, we gain insights, see distinctions, changes perceptions

**The Steps**

**1. Help Students Understand the Process**

* Explain examples of when people use comparing e.g. a time you compared a movie to a book and how it helped to make sense of both
* Brainstorm egs of comparison used in everyday life
* View a news programme and analyse number of times comparison of events celebrations, people used.

**2. Give students a model for the process and create opportunities for them to practice using the process**

a) give them a model for the process: even if they understand it, the steps help them do it rigorously:

1. Select the items you want to compare (what do I want to compare)?

2. Select the characteristics of the items on which you want to base your comparison (what is it about them that I want to compare?)

3. Explain how the items are similar and different with respect to the characteristics you selected (how are they the same/different?

b) create opportunities to practice

**3. As they study and use the process, help them focus on critical steps and difficult aspects of the process**

**Key points**

a) Take care not to overuse this process: students need to consider: why am I doing this comparison? Are the items I’m comparing important to this content knowledge? Is comparing the best way to extend and refine this knowledge?

b) Identify the meaningful/interesting characteristics and note the difference between interesting (but not adding much to learning) and meaningful. Can do this by:

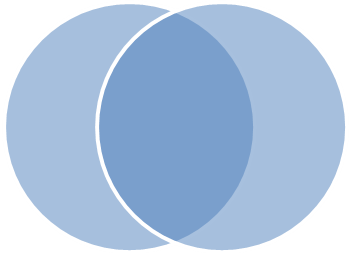
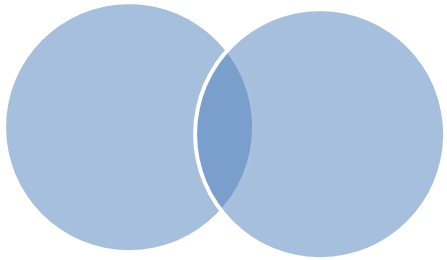
* Brainstorm for ideas for characteristics as a class, esp the first few times
* Use expanded comparison: use a comparison matrix: given several characteristics then asked to expand the matrix by adding additional ones of their own, and give feedback on their additions.

c) Ensure students know they’re doing the comparison to extend and refine knowledge: to reinforce this, ask questions about what they’ve learned ‘ what new connections did you make . . . what insights did you gain . . . what did you discover as a result . . . ‘

**4. Provide students with graphic organisers to help them understand the process**

**a) Venn diagrams:** a separate one for each characteristic of comparison (e.g. Items = US and Australia, characteristics = food, holidays) **FoodHolidays**

US Australia US Australia



**b) Comparison matrix**:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Items to be compared | | | Summary |
| Characteristics | 1. US | 2. Australia | 3. China | Sims |
| Difs |
| 1. Religion |  |  |  | Sims |
| Difs |
| 2. Government |  |  |  | Sims |
| Difs |
| 3. Legal System |  |  |  | Sims |
| Difs |

**5. Use teacher-structured and student-structured tasks**

a) Give a highly structured task when students are beginning to use comparison process

e.g. present them with the items to be compared, and the characteristics on which to compare them. Students describe the sims and diffs of the items using the selected characteristics. Then present main learnings e.g. on the different types of communities, after comparison of list of cities and characteristics re: size, jobs, crime rates etc

b) Then, get students to structure their own tasks, generating their own items to be compared, or characteristics to base their comparison on.

**Classroom Example**

*Geography students used maps readily in the classroom, but were reluctant to use ones unfamiliar to them. She led a class discussion on the different types of maps and their purposes. To extend and refine student understanding, she created a task where students identified features of map projections that make them useful, and choose three different types of map projections to compare the selected features. Students had to explain how the sims and diffs with respect to the characteristics they had selected.*

**2. CLASSIFYING**

**What is it?** Grouping things into definable categories on the basis of similar attributes.

**What does it do?** it organises our world, and influences our perceptions and behaviour: we pay more attention to the attribute of a thing that it is grouped by (purple if it’s purple things, round if its round things).

**The Steps**

**1. Help Students Understand the Process**

* Explain the concept and that consciously classifying things can influence their learning
* Brainstorm egs of classification used in everyday life and why it’s useful (organizing a wardrobe etc) to help find thing quickly.
* Get them to imagine how their perceptions/behaviour would be influenced if Coles was classified by price, if Jay Jays was classified by clothing size.
* Students select an item and put it into different categories (tiger – cat, stripes, killed by people) and note how what they notice changes.

**2. Give students a model for the process and create opportunities for them to practice using the process**

a) give them a model for the process:

1. Select the items you want to classify

2. Select what seems to be an important item; describe its key attributes and identify other items that have the same attributes (what things are alike and could be put into groups?)

3. Create the category by specifying the attribute(s) that the items must have for membership in the category (how are these things alike?)

4. Select another item and do step 2 again. (what other groups can I make?)

5. Do step 3 again but for this new category (how are things alike in this group?)

6. Repeat the last two steps until all items are classified and the specific attributes are identified for all categories

7. If necessary, combine or split categories and re-specify the membership attributes. (do I need to split up any groups or put any groups together?)

b) Create opportunities for students to practice using the process

Perhaps demonstrate with a think aloud process, then get them classifying things around them, getting them to explain the **rules** that describe the categories and the **reasons** for placing each item in a category.

**3. As they study and use the process, help them focus on critical steps and difficult aspects of the process**

**Key points**

a) Ensure when students are creating the 2nd category for classification (step 4 above) ensure it is related to the first (e.g. warm climate, then cold climate, rather than warm climate, then densely populated)

b) Ensure the attributes that are selected in step 2 above, are meaningful to the thing being classified, and allow them to discover something meaningful.

c) Ensure students give reasons for the placing of items in categories, esp as the content becomes more complex *(e.g. classify a list of military conflicts into at least 3 groups, explaining the rule of each category and how far each conflict has the defining characteristics of that category)*

d) Having students classify then re-classify the same group of items helps them notice unique distinctions that could be missed if they classify the items only once. This can be done by varying the context for the classifications (e.g. classify a list of plants as a gardener, as a doctor who treats people with allergies)

**4. Provide students with graphic organisers to help them understand the process**

**a) Category Grids**

**b) Bubble Charts** for more complex classification systems (vary size and layout of bubbles to demonstrate difference)

**5. Use teacher-structured and student-structured tasks**

a) Give a highly structured task when students are beginning to use classification process

e.g. present them with the items to be classified, and the categories into which they are classified. *(e.g. book titles classified into a)man vs man, b) man vs society c) man vs, himself to explore diff types of conflict in literature)*

b) Then, get students to structure their own tasks, give them a list of times but get them to identify own categories, or generate items and categories.

**Classroom Example**

*Students were studying the ways authors develop and use characters in literature. They were given list of 30 characters from several texts they’d studied/knew of, and asked to form categories and explain the rules they’d used to form them. Depth of understanding and range of categories used was good: ‘types of character flaws’ to ‘the kinds of changes characters undergo’ etc.*

TASK: Devise a classification task for your KLA. At what point in the lesson would you explain the purpose of the classification? (You may choose to get students actively involved in grouping items and explaining their reasoning for the different groups before you explore how classification has helped them think more deeply about their information.

**4. INDUCTIVE REASONING**

**What is it?** Inferring unknown generalizations or principles from info or observations (e.g. we infer someone’s mood or expectations of us from their behaviour) i.e. reading between the lines.

**What does it do?** It helps us work out things that are not explicit or overt (though the conclusions we draw may not be true, so the info gained must be use cautiously). It helps us avoid stereotypes if we realize how little info we sometimes infer conclusions from and work to gather more info.

**The Steps**

**1. Help Students Understand the Process**

* Give them an example of your behaviour to infer from (march into class, slam door, etc) and get them to explain the thought process they went through.
* Collect other examples of induction.
* Discuss the uses and necessity of induction in daily life (imagine if we could not infer . . . )

**2. Give students a model for the process and create opportunities for them to practice using the process**

a) give them a model for the process:

1. Focus on the specific pieces of info or observations. Try not to assume anything.

2. Look for patterns or connections in the information you have identified

3. Make a general statement that explains the patterns or connections you have observed

4. Make more observations to see if your generalization holds up; if it does not, change it as necessary.

b) create opportunities to practice:

1. Do a teacher think aloud activity: ‘I’m looking out the window and I see a man mowing his lawn. He looks in his 60s. It’s the middle of the day. It could be he’s retired. What else do I see or know that would support or refute this conclusion?

2. Take students on an ‘induction outing’! walk around the school/streets and make observations, then inductions, then describe the reasoning process.

3. Gradually hold students more accountable for making pure observations and have several observations behind their conclusions.

**3. As they study and use the process, help them focus on critical steps and difficult aspects of the process**

**Key points**

a) students sometimes offer inductions that are either

* restatements of the original information (I conclude the characters were angry because they said they were mad)
* descriptions of the observation (I conclude the salt melted the ice)
* opinions (I conclude the people were wrong to protest)

Remind students they the conclusions should represent a connection or a pattern among observations or information

b) ensure students base their conclusions on observation not assumptions. E.g. if the student concludes Poe was obsessed with death, based on the ‘observation’ that ‘his poems are weird’, they need it pointed out that the conclusion is based on an opinion not a pure observation. Help students practice checking the objectivity of their observations

c) good inductive reasoning needs conclusions that are based on as many observations or as much specific info as possible. Although one can never be sure conclusions are true, they have more validity if they’re supported well. Consistently push students to look for more info and observations to support or qualify their initial conclusions.

**4. Provide students with graphic organisers to help them understand the process**

**a) Graphic Organiser**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Observation | Observation | Observation | Observation | Observation |
| Conclusion | | | | |

**b) Inductive Reasoning Matrix**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Who governs?** | **How are decisions made?** | **What are some early examples?** | **CONCLUSIONS** |
| **Democracy** |  |  |  |  |
| **Republic** |  |  |  |  |
| **Monarchy** |  |  |  |  |
| **Dictatorship** |  |  |  |  |
| **CONCLUSIONS** |  |  |  | **SUMMARY CONCLUSIONS** |

This matrix helps organise large blocks of information to facilitate making inductions. Horizontal rows are concepts to be considered. These should all belong to a common category (e.g. types of govt). The columns are the questions. Students can draw ‘row conclusions’ (how do democracies govern?) and ‘column conclusions’ (how do governments make decisions?). They can also construct a summary conclusion that combines the elements of the row and column conclusions.

**5. Use teacher-structured and student-structured tasks**

a) Give a highly structured task, esp when the content is complex.

e.g. help them make the initial observations or select the imp pieces of information, help them see the connections or patterns and generate logical conclusions from these patterns.

b) Then, provide less structure. One of the goals of teaching students inductive reasoning is to help them begin to discover subtle connections and patterns within content even when they’re not explicitly directed to do so.

**Classroom Examples**

*Students selected a character from a novel and looked for patterns and connections in key actions attitudes and relationships of the character. They used these to draw conclusions about the characters personality and motivations.*

*Students reading Gulliver’s Travels were periodically asked to infer what might have been happening in England at the time the story was written.*

**REVIEW**

1. TASK: Using your knowledge of Dim 3, identify the complex reasoning processes students are using in each of the following classroom tasks (this in itself uses the process of abstracting (CRP3), finding a general pattern in some specific information):

* **English:** the teacher gives students a list of 20 books and asks them to place each book into one of two genres, fiction or biography
* **Psychology:** the teacher presents the features and functions of the central nervous system and guides them into developing a pattern for this information. Students are then required to identify another system that has parallel features and functions
* **English:** students are asked to find the similarities and differences between two novels they have studied. They are asked to focus their study on the extent to which characters are ‘flat’ or ‘rounded’ and the extent to which the author’s voice is apparent.
* **Interdisciplinary unit on The Future**: students asked to identify five events they believe are highly likely to happen in the next 50 years, five events that are moderately probable, five events that are highly improbable of happening. They must include in each list literary/artistic, political and scientific events and for each, describe the reasoning that led to each prediction.
* **History:** students are given several options for a project. One option is to take the role of a Greek god or goddess and present an argument for why this god or goddess should be the supreme ruler of Olympus.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Bloom’s Revised Taxonomy** | **Dimensions of Learning Dim 3 Complex Reasoning Processes (CRPs)** | **Dimensions of Learning Dim 4 CRPs** |
| **Creating** Generating new ideas, products, or ways of viewing things Designing, constructing, planning, producing, inventing. | CRP8: Analysing Perspectives | CRP1: Decision Making  CRP2: Problem Solving  CRP3: Invention |
| **Evaluating** Justifying a decision or course of action Checking, hypothesising, critiquing, experimenting, judging | CRP 3: Abstracting  CRP4: Inductive Reasoning  CRP 6: Constructing Support | CRP4: Experimental Inquiry  CRP5: Investigation |
| **Analysing** Breaking information into parts to explore understandings and relationships Comparing, organising, deconstructing, interrogating, finding | CRP1: Comparing  CRP 7: Analysing Errors | CRP6: Systems Analysis |
| **Applying** Using information in another familiar situation Implementing, carrying out, using, executing | CRP5: Deductive Reasoning |  |
| **Understanding** Explaining ideas or concepts Interpreting, summarising, paraphrasing, classifying, explaining | CRP2: Classifying |  |
| **Remembering** Recalling information Recognising, listing, describing, retrieving, naming, finding |  |  |

* What do you notice about the diagram’s mapping of Bloom’s Taxonomy against Dim 3 and 4’s complex reasoning processes?
* Could you map some of DoL’s complex reasoning processes against other stages of Bloom’s taxonomy? Which ones and why?
* What does this suggest about the nature of thinking and learning?

**Comparing Popularity of Sports**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **AFL** | **Cricket** | **Chess** | **Golf** | **Conclusions** |
| Average annual compensation |  |  |  |  |  |
| Percentage of women playing competitively |  |  |  |  |  |
| Average number of years players can compete |  |  |  |  |  |
| Chances of players suffering from serious injury |  |  |  |  |  |
| Chances of high school players winning a scholarship |  |  |  |  |  |
| Chances of players appearing on a Weet-Bix box |  |  |  |  |  |
| Size of crowds attending events |  |  |  |  |  |
| Numbers of people watching or listening via the media |  |  |  |  |  |
| **Conclusions** |  |  |  |  |  |

**Would you classify the following as living, dead or ?. Explain**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Living** | **Dead** | **?** | **Explain** |
| Bacteria |  |  |  |  |
| Volcanoes |  |  |  |  |
| Active |  |  |  |  |
| Ghosts |  |  |  |  |
| Petrified wood |  |  |  |  |
| Coral Reefs |  |  |  |  |
| Thoughts |  |  |  |  |
| The Loch Ness Monster |  |  |  |  |
| Seaweed |  |  |  |  |
| Fossils |  |  |  |  |
| Lightning |  |  |  |  |
| Blood |  |  |  |  |
| Pearls |  |  |  |  |
| Fingernails |  |  |  |  |
| The sun |  |  |  |  |
| Mummies |  |  |  |  |

**Geography Terms**

* Classify these into 3-5 groups, with rules for each group.
* What have you learned as a result of this activity? What do you notice about the groups?
* What questions do you have about the groups?
* Now reclassify your items but into a completely different set of groups.

|  |  |  |
| --- | --- | --- |
| Basin  Bay  Canal  Canyon  Cape  Channel  Continent  Delta  Divide  Fall line  Fjord  Foothill  Glacier  Gulf | Harbor  Highland  Hill  Isthmus  Lowland  Marsh  Mesa  Mountain  Range  Mouth (of a river)  Peak  Peninsula  Plain | Plateau  Port  Prairie  Rain forest  Reservoir  Source (of a river)  Strait  Stream  Swamp  Tributary  Tundra  Valley  Volcano |