

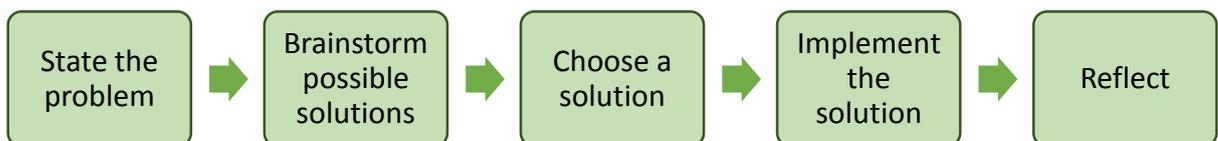
Module 5 - Teaching competences and values

Guidance material	5.4.3 Teaching Problem Solving Grade 10-12
What is the purpose of this material?	<ul style="list-style-type: none"> This is a selection of teaching strategies and teaching templates to support the teaching of problem solving
When to use this material?	<ul style="list-style-type: none"> When introducing the competences to teachers to support them in implementing this competence in their class programme.
With whom to use this material?	<ul style="list-style-type: none"> Teachers
Have you considered these materials first?	<ul style="list-style-type: none"> Introduce teachers to the SCF through: <ul style="list-style-type: none"> 1.1 What is the SCF? 1.2 Structure of the SCF 1.3 Definitions matching activity 1.4 Prior knowledge brainstorm activity 1.5 Close reading – Executive summary 1.6 Close reading – Framework Requirements and Exemplifications 4.1 What are competences? Introduce teachers to this competence through: <ul style="list-style-type: none"> 4.1.4 What is Problem Solving?
How to use this material?	<ul style="list-style-type: none"> This resource can be used in a range of ways, for example: <ul style="list-style-type: none"> Share with teachers and discuss it in staff meetings or team meetings. Encourage teachers to plan using the ideas in this resource. Encourage teachers to adapt the teaching strategies and templates below to meet their grade level, curriculum area and student's needs. Discuss the ideas and then ask teachers to share their own ideas for teaching this competence. For more information on each competence read the <i>Framework Requirements & Exemplifications</i> section of the <i>Abu Dhabi Education Council Student Competence Framework (SCF) for Private Schools - Competences for Abu Dhabi's 21st Century Learners (2014)</i>. Note: All websites were checked at the time this guidance material was created. Any website used in an educational context should be checked for accuracy and appropriate content. Links to other websites from this material should not be taken as endorsement of those sites or of content/products offered on those sites
What resources or equipment are needed?	<ul style="list-style-type: none"> Copies of the <i>Framework Requirements & Exemplifications</i> section of the <i>ADEC SCF for Private Schools (2014)</i>.

Teaching Problem Solving Grade 10-12

Here are some strategies and teaching approaches to try in your classroom to promote problem solving:

- Students are asked to identify and develop a solution for a current problem in their community. They need to define the problem, identify possible solutions, weigh and analyse the solutions and make a recommendation. They need to consider the implications of the solution for the community and identify underlying constraints that could lead to additional problems e.g. the national rise in the number of diabetes cases, and linking this to a school wide awareness campaign that includes devising a plan that ensures that students have periods of physical activity throughout the day.
- Students that show initiative are supported to follow-up on opportunities to take action that makes a difference – at the personal, local, global level. e.g. Citizen Science Projects
- Students work collaboratively to meet a social need e.g. they undertake to connect with children who have been hospitalised, by making toys and puzzles that the students can use during their stay in hospital, or take home as a reminder that other students have thought about and empathised with their predicament. Students will need to: research and provide a range of age specific toys/activities, make an action plan, identify stake-holders, seek permissions, raise funds and chronicle their journey using digital tools in order to share the process with stake-holders and others.
- Students work independently and collaboratively in groups to solve problems using the problem solving process. Here are two different problem solving processes:



Pólya's four stages of problem solving:

<p>Step 1: Understand and explore the problem</p> <ul style="list-style-type: none"> • What do you already know? • What do you not understand? • What are the causes of this problem? • What are the effects of these causes? • What are the obstacles? 	<p>Step 2: Devise a plan</p> <ul style="list-style-type: none"> • Have you seen a similar problem before? • Which strategy will you use to solve this problem? • What steps will you take to solve the problem?
<p>Step 3: Carry out the plan</p> <ul style="list-style-type: none"> • Carry out your plan to get to a solution 	<p>Step 4: Look back and reflect on the solution.</p> <ul style="list-style-type: none"> • Can you check your solution? • Did you select the best strategy? • What would you do differently next time?

Although Pólya's four stages of problem solving are listed in order, for difficult problems it may not be possible to simply move through them consecutively to produce an answer. You might need to move backwards and forwards between and across the steps.

(Pólya, George (1957). "How to Solve It". Garden City, NY: Doubleday)

- Teach students how to use diagrams when solving problems.

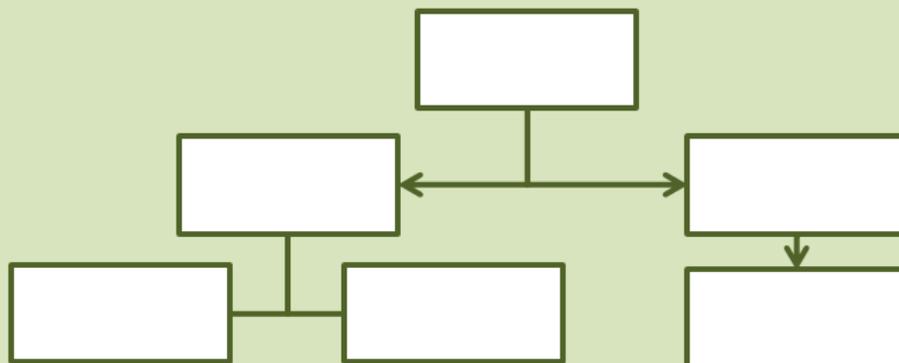
Chain diagram

Chain diagrams usually represent a *sequence* of events needed for a solution. The elements of the problem are set out in words, usually placed in boxes, and positioned in different places on a sheet of paper, using lines to represent the relationship between them.



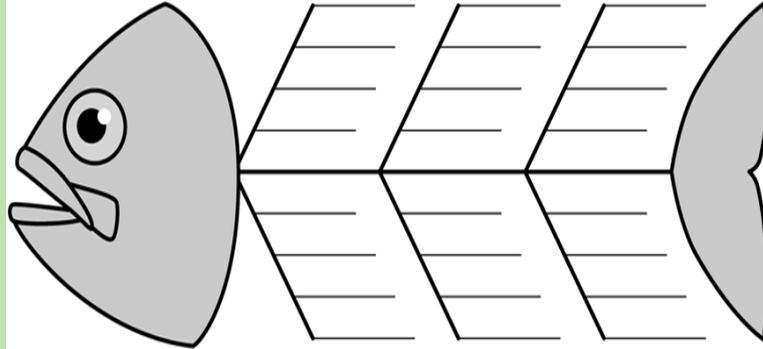
Flow charts

Flow charts allow for inclusion of branches, folds, loops, decision points and many other relationships between the elements. In practice, flow charts can be quite complicated and there are many conventions as to how they are drawn but, generally, simple diagrams are easier to understand and aid in 'seeing' the problem more readily.



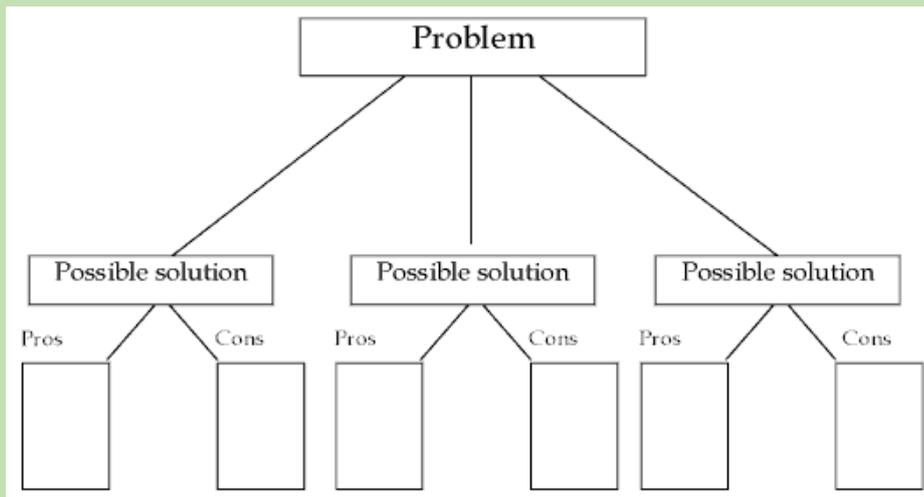
Fish bone, cause and effect

Write the problem in the fish head. Beside each long diagonal bone write the causes of the problem. Beside each small horizontal bone write the effects of the causes.



Consequence diagram

A consequence diagram helps you see the pros and cons with each solution.

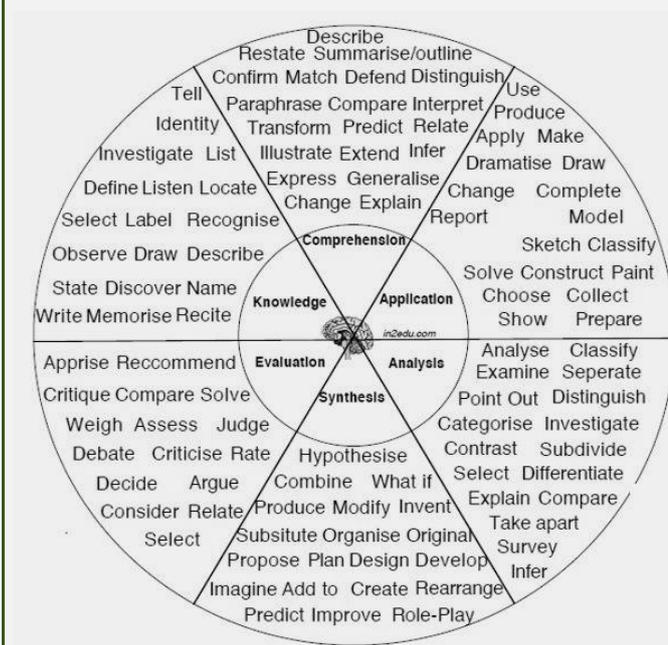


SCF Pilot School Case Study

Blooms action verbs

SCF Pilot School

Bright Riders Private School



Many teachers are familiar with the [Blooms Taxonomy Action Verbs wheel](#), but Bright Riders Private School have taken this tool one step further. They have reorganised the action verbs into the SCF competences. Teachers use the action verbs when writing their learning outcomes. They start their learning outcome with an action verb that matches the major competence they and their students are focussing on.

Blooms action verbs for: **Problem Solving**

e.g. By the end of this lesson students will be able to **compare** different approaches to solving the fraction problems.

Action verbs:

Identify	Perform	Generate	Act
Solve	Demonstrate	Debate	Justify
Observe	Predict	Compute	Show
Analyse	Explain	Categorise	Apply
Infer	Judge	Tabulate	Calculate
Record	Examine	Discover	Compare
Hypothesize	Employ	Analyse	Undertake
Provide	Consider		