Formative Teaching Methods Geoff Petty Jan 2004

The strategies below are mostly for teaching where there is a ‘right way’ to answer questions (convergent learning). For example:

* calculations in mathematics, science, accounts or similar
* punctuation, grammar, translation or other language skills
* mastering content: basic knowledge and comprehension in any subject
* they can be adapted to teach practical skills, indeed to most skills teaching
* they can be adapted to teach social skills such as dealing with a customer complaint.

**Groundrules for self and peer assessment:**

If Formative Teaching Methods are to be used effectively students must enter into the methods with the right spirit. Try to agree the following with your students:

**We will learn best if we all agree that:**

* It’s okay if you don’t fully understand a concept first time, learning takes time.
* If work is graded, aim to beat your own record, not someone else’s. However, grading should be avoided where possible.
* what counts is whether you understand the problem and solution, or question and answer eventually:
* not whether you got it right first time
* not whether you got it wrong just because of a silly slip
* It is not humiliating to make a mistake. We all make mistakes when we learn. Indeed is part of how we learn. If we don’t make mistakes the work is too easy for us to learn at our maximum rate.
* Mistakes are useful because they tell us where we can improve.
* Its good for learning to admit to not understanding and to admit to mistakes and then ask for clarification.
* we should never ridicule each other for mistakes, even in a joking way
* You will learn from mistakes if you find out how to do it without mistakes next time, and really understand this.

Are you brave? As an half-hour long exercise to get your students into the right spirit, you might like to ask them to say ‘hooray’ every time they notice one of their own mistakes!

# When to use Formative Teaching strategies

Some of the strategies that follow are very demanding. If students find them difficult or tiring you might like to reduce the time spent on them, but don’t give them up. They are too powerful to abandon.

Do listen in to the peer explaining and peer assessing conversations they will give you valuable, if depressing insight into the level of your student’s understanding, but don’t butt in.

If students are not much good at peer explaining, self-assessment, or peer-assessment this is no reason to abandon them. It is a reason to give your students more practice in it. However, you might want to use corrective peer explaining, and to review peer and self assessment after it has taken place to stress the key points and deal with common weaknesses.

**Formative Teaching Strategies**

**1. Peer Assessment in pairs**

The simplest form of peer assessment is to get students to work alone on an exercise for five minutes or so, and then get pairs to swap their work and assess each other’s. Feedback is usually verbal rather than in writing. It needs to be given in a supportive way.

Peer assessment in pairs with model answers

Another strategy which Gibbs found almost doubled attainment on a university engineering course is as follows. This strategy is useful if you are setting less work for students than you would like because you can’t keep up with marking. However peer assessment is good practice anyway.

* Students do a worksheet of questions and put their name on it
* They hand these to the teacher, who gives them out to other students to mark. Students do not know who is marking their work.
* Students mark their peer’s work using ‘model answers’ or ‘worked solutions’ including a mark scheme provided by the teacher.
* The work is handed back to its rightful owner and students each keep the worked solutions. Most students will probably check the quality of the peer’s marking, but the teacher does not.
* In the case Gibbs reports, the teacher did not even take down the marks that the students’ obtained. The average mark on the unit rose from around 45% to around 75% as a result of this strategy! (You could of course collect marks at this stage if you prefer.)

The process of marking another’s work has a number of striking advantages over having your work marked by the teacher. Students see alternative ways of answering the questin or solving the problem; they see model answers or worked solutions and have to study these closely during the marking; and they see where marks are gained and lost. This makes the ‘goals’ clear. Students also have to make judgements about their peer’s work, which requires them to clarify their understanding of the subject matter, and the goals set. What is more, the goals are learned by induction from studying the concrete worked solutions, this is a powerful way to learn.

This is an excellent way of getting students to do more work than you can mark, but it is much more than this. The method contains a ‘hidden message’. It teaches students how to avoid mistakes, and how to improve, but more than this it teaches them that mistakes are avoidable, and that improvement is possible. It shows students that achievement is not dependent on innate talent, but on doing the job well. It is difficult to overestimate the importance of this message, it has been shown to have a huge effect on student’s motivation and achievement. (See the Dweck handout on the motivation page of my moonfruit site).

It does not matter if students do not make perfect judgements, and you need not arbitrate in every case. The desired outcome is that learners clarify their understanding, and set themselves goals for improvement, if this outcome is achieved that is often sufficient. I am not of course saying that teachers need not mark student’s work, only that peer assessment is very useful.

## 2. Peer Assessment in groups

* Students are arranged in groups of three or four, it’s best if they are not friendship groups. It can be done in pairs but the more learners in the group, the more their answers are likely to differ in ways that help students to learn.
* Students are given questions or calculations to do, which they work on alone in the first instance (say five minutes)
* Students compare their answers, reasoning, methods, working etc, noting differences. They discuss and try to agree:
* Which are the correct or best methods, workings, reasoning, and answers etc and why
* The groups idea of the ‘ best answer’.
* What errors were made by group members, and why (this is done in a supportive and constructive manner)
* The students are then given model answers and compare their group answer with the teacher’s model answer.

See also 4, Peer assessment of deliberate errors below.

**3. Peer Explaining**

Peer explaining of model answers

Peers explaining of model answers

This is a variant of the above, and was devised and researched by Carroll. She found that this method enabled students to learn the skill faster while making less errors, even though more stages are involved than the usual method (which is to use only 1 and 6 below).

1. The teacher demonstrates ‘how to do it’ on the board, explaining and ‘thinking out loud’ in the usual way. E.g. how to use tangents to determine an unknown angle , how to use apostrophes, how to write a care plan from a scenario etc
2. Students are arranged in pairs, not necessarily with friends.
3. The teacher has prepared two sets of questions with their model answers fully worked. Each contains a variety of different types of questions very similar to the ones demonstrated by the teacher. Each pair has one of each set. Each student only works with one of the sets in the next stage.
4. Students study their own model answers alone, preparing for the next stage (say 5 minutes)
5. Each student explains their set of model answers to their partner, pointing out what was done and why, and why the method and working is sound.
6. Students then practice doing some by themselves in the usual way.

The idea behind this method is that, if teachers go straight from 1 to 6 this is too big a leap for many students. It goes straight from knowledge to application on Bloom’s taxonomy. Consequently weak students are trying to comprehend the method at the same time as trying to apply it which is too much for them.

Weak students often report that they understand the teacher demonstration, yet are unable to “do one by themselves.” This strategy provides an ‘extra rung on the ladder’ (strengthening comprehension on Bloom’s taxonomy) which makes students conceptualise the method by requiring them to express it in their own words.

Once students are used to peer explaining they can be encouraged to explain to small groups, or to the class as a whole. “John, can you explain your solution to question 8 on the board?”

Teacher shows how on the board

Students do some on their own

# Peer explaining

Usual 2 step

approach

Carroll’s 3 step

approach

Students do some on their own

Teacher shows how on the board

knowledge

application

comprehension

application

knowledge

Pilot and navigator:

This works well for students working on computers in pairs but can be used in other contexts. Students are paired up, one takes the role of navigator, and the other is the pilot. The ‘navigator’ tells the ‘pilot’ what to do and why. E.g. “Okay, with the mouse, go up to File and choose Print.”

The pilot does this, and is corrected by the navigator if necessary. The navigator is not allowed to ‘take the controls’. This works best if the navigator is the stronger student, however, taking turns in the roles also works well. It’s harder to explain clearly than iit is to do it, so navigators often learn more than their pilots.

Peers explain a summary of key points

At the beginning of the lesson the teacher makes it clear to learners that at the end of the lesson they will be required to peer explain the key points of the lesson. These two points are given in advance for example:

“What is Pythagoras’s Theorem, and when does it apply or not apply?”

“How can the theorem be used to find an unknown side of a triangle?”

Or

“Who supported Cromwell and why?”

“What were Cromwell’s key goals and how do we know these?”

The lesson then continues in the usual way with the aim of teaching the two key points mentioned. At the end of the lesson the peer explaining takes place like this. It usually takes between five to ten minutes.

* Students are put into pairs and given one objective each ‘those nearest the window please answer the first question’
* Students prepare for a minute what they will say to each other
* They peer explain their key points to each other, the listener is allowed to mention ways of improving their partners explanation only after they have finished.
* The teacher then gives model answers, and asks the pair ‘what did you miss out or get wrong?’ Pairs then discuss this, correcting themselves first, and then each other.
* The teacher can then ask students to prepare for a repeat peer explaining session at the beginning of the next lesson. The challenge is to fix any weaknesses found in the first peer explaining session.

There is a danger that students or their teacher will see this method as a ‘cramming’ technique to force rote memory. However, it purpose should be to ensure that key points, the structure of the material, and their and meaning are properly understood. So stress why the key points are key points, and stress the meaning of the structure of the information. Attend at least as much to the why as to the ‘what’ of the leraning.

This strategy has some of the properties of ‘mastery learning’ which adds at least a grade to student achievement see “Teaching Today” Geoffrey Petty for more on mastery learning.

Peers explain their answers to questions.

This is a simpler version of the above. It is a useful way of encouraging participation in question and answer, and for providing the “wait time” needed for students to engage with questions fully.

* The teacher explains the following process so students know what is about to happen
* The teacher asks a question that is reasonably thought provoking, or sets them a short task to do on paper or similar.
* The students are asked to work on this alone for a given period of time.
* Students explain their answers to each other. Only after their partner has finished explaining can they challenge or comment on the answer. When both answers have been expressed they can compare and discuss their answers.
* The teacher gives the correct answer to the question and asks students to discuss the extent to which they both got it right, and to explore any misunderstandings that they had.
* Optionally there can be a class discussion on any issues raised, and on misunderstandings etc which should be considered as interesting and useful learning opportunities. (See the ground-rules above)

**4. Peer assessment of deliberate errors**

This is a variant of peer explaining exemplars described above, and is often done immediately after it.

* Students are put in pairs
* Students are given a set of worked examples containing deliberate errors. The two students in each pair have different examples.
* Students work on the own to find:
* What’s wrong
* Why it’s wrong
* How to do it right
* Each student in the pair explains the errors in each of their examples to their partner
* If a students has noticed errors in their partner’s examples that they have missed they now point these out.
* The teacher then asks students for the errors they have found, and confirms or denies these. The teacher clarifies misconceptions carefully.

This is a fun activity and a useful exercise to “inoculate” students against common errors and misunderstandings. It should not be done too early in a topic for fear of confusing students, but it very useful at the end of a topic to discover and correct any lingering misconceptions. If students cannot error spot, they will not be able to proof-read their own work.

**Advantages of Peer Assessment:**

* Students learn other ways of doing it, and gain a wider view of what is possible.
* By evaluating methods they come to understand them better
* They become more reflective of their own learning. For example, if a student realises they got one calculation wrong because they confused a sine with a tangent that is very helpful.
* Students greatly enjoy this method, and both ‘helpers’ and ‘helped’ learn if they support each other constructively. (The standard of discussion is commonly higher than you expect!)
* They attribute success to effort, using the right strategy etc rather than innate ability. This ‘empowers’ learners to improve.

## 5. Self Assessment

Self-assessment using goals assessment criteria, or objectives

* At the end of a task, topic, or lesson, students are reminded of the goals, objectives, or assessment criteria. Students are then asked to take say, five minutes to look over their work and self assess:
* What they have learned, know, and can do
* What they still need to learn or practice to achieve the goal or objectives
* Students use this to set themselves an individual action plan
* The action plan is implemented next lesson

**Examples:**

Students have just completed drawing a graph, they use assessment criteria developed and explained during the lesson to assess their own work.

Students have completed a lesson on hair colouring, which had three objectives given in advance. The objectives are presented on the OHP, and students reflect on whether they believe they have met them.

Students have completed three lessons on the rift valley. The teacher writes up a checklist of statements in the form “I can now identify a rift valley on a map” etc. Students work alone to decide whether they can meet these goals.

Students have just completed the first of two presentations. They self-assess against criteria which were determined in advance, and then set themselves goals for their next presentation.

# Using an assessment proforma to assist self, peer, and teacher assessment

# Here is an assessment proforma for marking calculation in mathematics, or science etc. It helps to focus student’s efforts on the most important skills, rather than just on getting the right answer. See <http://geoffpetty.moonfruit.com> for many more examples of assessment proformas.

|  |  |  |
| --- | --- | --- |
| Assessment criteria | grade | Teacher, peer, or self-assessment |
| **Methods:** aim to make these appropriate, and as simple or elegant as possible. |  |  |
| Methods justified: The principles or formulae used are made clear |  |  |
| **Working:** aim to make working clear; complete; easy to follow; stating principles or formulae used where necessary. |  |  |
| **Care taken:** aim to check your work for errors, and present work neatly. |  |  |
| **Main strengths** |  | |

## Self assessment as a workshop review

Carol Nyssen of Oxford College uses this strategy with her Hairdressing and Beauty students. She uses the strategy with her whole teaching team but it could be easily adapted for use with a single teacher.

* Objectives are stated at the beginning of each lesson by every teacher in the team and are written by students in an exercise book specifically for this purpose.
* Students review their learning against the objectives at the end of each session.
* There are weekly skills workshops where students review the objectives for the whole week, picking out those they feel least confident about.
* The workshop teacher deals with any objectives the whole class has had trouble with
* Students are supported in personal work towards the objectives they have personal difficulty with.

This requires that the workshop is run by a teacher who can think on her feet, and who has an excellent grasp of the whole curriculum. It also requires the availability of suitable books and other learning materials.

Self-assessment using model answers

This is a student activity which follows the teacher explaining and modelling ‘how to do it’ to the class

* The teacher explains that students will mark their own work on this exercise, and that the teacher will not mark it. (However the teacher can check whether or not students have self-assessed.)
* Students do an exercise, which might be a series of questions. When they have finished they proof-read their own work before the next stage.
* Students are given model answers or examplars. These might have a mark scheme on them.
* The students mark their own work against these model answers. If they do not understand an answer, or why their answer is wrong, they try to puzzle this out for themselves rather than ask immediately for help. The teacher offers help where needed, but does not mark the work or check the students own marking usually.
* Students can then do the next few questions and so on. The self assessment using model answers can be done in stages through a worksheet, for example every two questions.
* Optionally the students could correct their work. However, it is best if they do not offer this work for marking by the teacher. If they expect the teacher will mark their work, they will often just copy the right answers from the model without trying to understand them! If the teacher will not mark their work they are motivated to work out for themselves how they have done.

Some students find marking their own work preferable to a peer or teacher marking. Self-assessment develops understanding and confidence. It makes more demands of the learner and less of the teacher, a characteristic of effective learning methods generally. This method is related to peer assessment methods. Indeed the same resources could be used to do both or either depending on student choice. A ‘compromise’ method is that students share the model answers but mark their own work, discussing any issues together where necessary.

Students enjoy this method much more than you would think. Because the feedback is almost immediate it is very motivating, and the more frequently the feedback occurs the more motivating it is. Try arranging the questions and model answers so that self-assessment occurs after about every five minutes of student work. You must then make sure that students only see the model answers for the questions that they have completed of course!

Some students will need help concluding what they have learned from comparing their answers with the model answers. You could ask them to write this down, or relate it to you before proceeding. Ask them ‘what are the rules about how to do it? As they relate these, acknowledge correct responses and then ask “why?”. That is, ‘why’ does this rule apply.

Self assessment with a formative test

* Students complete a test on the work they have done during the last half term
* They self-mark their paper using worked solutions provided by the teacher
* They are provided with a list of topics and subtopics that appeared in the test, and are asked to mark each as:
* Green if they can understand how to do them (ignoring careless slips)
* Red if they do not understand how to do them
* Amber if they are not sure

How did you do on: Name:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Red  It’s holding me up | Amber  Not sure | Green  It’s not holding me up |
| sin |  |  |  |
| cosine |  |  |  |
| tangent |  |  |  |
| Pythagoras |  |  |  |

* The teacher looks through these self-assessments. If there are lots of red blobs next to a topic, then this topic is reviewed.
* Students write action plans to respond to their individual weaknesses. E.g. “I need to remember to square root my answer when I use pythagoras’ theorom”

This action plan could be checked by teacher or by a peer, (preferably not a close friend). For example, students could be asked to explain how to do the questions they have been working on to their peer. (See peer explaining below).

### Advantages of self assessment

* A research study, employing a similar method to the above doubled attainment in numeracy. (See the Black and Wiliam Review (1998))
* It makes students aware of the goals, and familiarises them with the characteristics of acceptable work
* It helps them work out how to improve, that is, to identify the gap between their present skills and the learning goals.
* It encourages students to take responsibility for their own learning
* Students reflect on themselves as learners and so learn to learn, this ‘meta-cognition’ (thinking about thinking and self-regulating their own learning) has been shown in many studies to greatly improve learning.
* The most important advantage of self-assessment according to many theorists is that it makes students realise that success or failure depends not on talent, luck or ability, but on practice, effort and using the right strategies. When students realise this they are motivated to improve. See internal attribution at the end of this document.

#### 6. Spoof-assessment

A ‘spoof’ piece of work is one created by the teacher specifically for the purpose of spoof-assessment. It is presented as if it were done by an imaginary student. For example:

A teacher presents two pieces of work ‘X’ and ‘Y’ and asks students to mark and grade these.

*For mathematics or similar work* students are given the answers to the work:

One piece of work has all the right answers, but the methods are not explained or justified, some are over long, and the working is not clear.

The other piece of work has some wrong answers, but the methods are correct, fully explained and justified, and the working is well laid out and easy to follow.

Most students will give the worst work the best mark because they believe the goal is to get the right answer, and do not consider methods and working.

*For written work:* One piece of work is long, has many technical terms and impressive diagrams and is written in long sentences with quite complex grammar. While superficially impressive the work does not answer the question. The other spoof piece of work is short, only uses technical terms where necessary, and answers the question very well and very concisely. Again, students usually give the worst work the best grade because when they read tasks or assessment criteria they do not pay enough attention to them, or do not understand them well enough.

In both cases there is class discussion after students have given their judgements. This is used to underline learning points and to explain the criteria for good work. This discussion is very important and is aided by the fact that all learners have copies of the sames pieces of work, unlike peer or self assessment. The teacher can direct attention to this work and to the criteria. “Look at work ‘X’ did they justify their answer as question 3 required? What does it mean to justify an answer? Let’s look at how ‘Y’ did this…… ”

The first time you use spoof assessment it is fun to tell students that one piece of work is an ‘A’ grade and one is a ‘D’ grade and ask them which is which. When they get them the wrong way round, as they usually do, ask them for a homework to go away and work out why.

Students may, or may not be given assessment criteria the first time they do spoof assessment. If no criteria are given it helps to conclude discussions on the work by stressing how important these criteria are, and what they are. However students will benefit greatly from being given criteria for later attempts, so they can practice interpreting them and so learn what they mean. Spoof assessment is one of the best ways of getting students to really understand assessment criteria and assessment language. The teacher discussion can be used to explain any misunderstandings.

Spoof work can in fact be work done by a student in a previous year but with their name removed. In this case you ought to have that student’s approval to meet copyright law, even thought their name is not being used. If students present work electronically it is not too difficult to save work for this purpose.

Many students believe that ‘describe’, ‘explain’, ‘analyse’, and ‘evaluate’ all mean pretty much the same thing: ‘write about’. Spoof assessment can really help them to understand assessment language.

Another useful method is to use ‘decisions-decisions’. Students are given phrases or short paragraphs of text to classify as descriptions, explanations, analyses and evaluations.

#### Spoof assessment with one piece of work

It is not always possible to have two pieces of work as described above, or the time to discuss it. An excellent homework activity is to give students one good piece of work from last year to assess against clear criteria immediately after students have completed an identical or similar task.

Students learn a great deal from examples of good practice like this. It is a very natural way to learn, animals learn this way – and we are animals after all!

At first students may copy the surface characteristics of the good work they assess, but with skillful mediation from the teacher, they get to learn the important characteristics of this good work and adapt what they see to new situations.

#### 7. Explaining tasks

#### Students need to learn that the objective is not simply to rote-learn procedures to get the right answer, but to become a mathematician (or language specialist etc). This requires that they understand strategies, know when a strategy will work or not work and why, and know more than one way of doing things, and so on. Mathematics and other skills teachers can set ‘explaining tasks’ to assist this development. For example:

#### *“In your own words, explain Pythagoras’s Theorem, describing when it does and does not apply. Explain also how it can be used to find an unknown side of a triangle.”*

Such tasks help students to develop an understanding of concepts, and to remember them.

Peer explaining

Explaining tasks can be set as written homework, or as verbal pair-work in class. For example the task above could be split into two, and a pair of students be asked to take half each, and explain to each other. They could then peer-assess each other’s explanation giving one strength and one suggested improvement.

Corrective Peer Explaining

To make the peer explaining activity described above truly formative, the teacher now gives the students the ‘correct’ explanations very briefly, and asks the students to identify how their explanations could have been improved. Students do this for themselves first, and then explain these self-improvements to each other. Only then can pairs suggest improvements to each other’s work. Students are then asked to prepare for the next activity with the goal of explaining without any mistakes or omissions.

At the beginning of the next lesson the same peer-explaining task is repeated as a review, but also to check that improvements have been made. Students need to be discouraged from rote learning, they should explain their answers, and give them in their own words.

Advantages of Peer Explaining

‘Explaining tasks’ require students to clarify their understanding and check this. There may also be corrective work done on these understandings. There is a focus on key points as explanations are usually short. This requires students to structure their understanding, a prerequisite for it to pass into the long term memory.

*Some examples of tasks for peer explaining*

‘How can you tell whether to use a sine or a cosine to find the unknown side of a triangle? Draw some diagrams to help you explain. One of you take sin, the other cosin.’

‘Explain in your own words where you would we use a comma, and where you would use a full-stop in a sentence. One of you take the full stop the other the comma.’

‘The one nearest the window explain what is meant by a care plan, and the other explain the main criteria for evaluating a care plan.’

**8. Doing corrections**

Getting questions right you initially got wrong ensures you improve understanding and unlearn misconceptions. It also makes students more careful if they know they must correct errors. However, errors due to simple slips can usually be ignored, it’s fundamental errors that require correction.

This strategy, like most teaching strategies, can be overused. Students may find it too dispiriting if you ask them to correct all their work, and they may well not be able to keep up. However, the method can be underused too. Students sometimes need to have another go at something if they are really to understand how to do it properly.

**9. Diagnostic Questioning**

Compare the following two alternative approaches to questioning the same student.

Teacher: “Is 7 a prime number?”

Student: “Yes”

Teacher: “Why?”

Student: “Because it’s odd”

Teacher: “Is 7 a prime number?”

Student: “Yes”

The first question, being factual, low on Bloom’s Taxonomy, and closed, has not diagnosed that the student is suffering the misunderstanding that prime numbers are the same as odd numbers. The ‘why?’ question because it requires explanation discovers the misunderstanding. Further questioning and explanation can then be used to diagnose the misconception more fully if necessary, and then to correct it.

Questioning is an excellent and immediate method to ‘find faults and fix’, but only works if the questions are diagnostic, and if there is corrective follow-up. Ask searching questions and think about the misconceptions behind wrong answers. The QCA reference has some fascinating detail on this for mathematics teachers.

**10. Mastery test**

* Set a *simple* quiz or test focussing on key points. This could consist of almost any activity for students:
* recall questions on key facts,
* a number of simple calculations to do
* a practical activity
* some simple past paper question(s), etc.
* Students mark their own. Students compare their answer with the model answers you give them, and mark their own papers. The questions need to be easy enough for students to understand the model answers, and to be able to mark their own paper.
* Students note the questions they got wrong, and note also the correct answers for these questions. They could take photocopies of the test and model answers away to work on the questions they got wrong.
* Students retake the test, doing only those questions they got wrong the first time. Alternatively they could do a retest, again only doing the questions similar to those they got wrong. This could be a few days after the first test, and will not take long. If a student needs to do most of the questions they can do it in their own time. Students also mark this re-test themselves. Optionally students could take a similar but different test..
* Students report on any improvement. Ideally students have a target to aim at, say a mark of 8/10 and keep correcting their work until they achieve this.

As in peer explaining of key points above, make sure students understand the materials and its structure, attend to the ‘why’ at least as much as the ‘what’ of the learning. See ‘Teaching Today’ Geoffrey Petty for a full account if you intend using this method as it has some pitfalls.

**11 Student questioning and ‘mountain climbing’**

This is less rigorous than mastery testing, but more fun. I will describe a version of this game for level 2 learners, but it can easily be adapted for more advanced learners.

You split the past week or two’s teaching between teams of students who write three or four mastery questions (low on Bloom’s taxonomy) with answers for their subtopic. You check these questions and answers, making sure they are on vital material, are truly mastery questions, and have good answers. Groups make enough copies of their cards for what follows.

The following are examples of question cards for a game on the topic of mastery learning. The students who have written these questions and answers have already learned a good deal. The questions can be typed into a table in a word processing application. (If you set ‘autofit’ to ‘distribute rows and columns evenly’ all the cards become the same size.) You can then print on thin card with a different colour for each topic if necessary, and cut into question cards. Alternatively they can be handwritten.

|  |  |
| --- | --- |
| **Question:**  Give two key characteristics that make a question suitable for a mastery test | **Question:**  Give two key differences between a mastery test and a conventional test |
| **Answer:** accept 2 from:  It should test vital knowledge, and be low on Bloom’s taxonomy.  The material must have been practiced | **Answer:** accept 2 from:  The students must do remedial work.  Everyone passes eventually.  There is no mark, just pass or not yet passed.  Questions are low on Bloom |

Students can pass their group’s questions on to the next group so every group gets a set of questions, and the sets rotate.

Alternatively Students work in pairs with a complete set of the cards. They take it in turn to ask each other a question. If the student gets it right they move their counter up one square on a game board with a mountain drawn on it. There are almost as many squares up the mountain as there are question cards. If a student does not get their question right, they keep their ‘wrong card’ and can study the correct answer during the game. One square before the sumit of the mountain is a ‘base camp’ where students must take a second attempt at all their ‘wrong cards’. The object of the game is not to get to the summit first, but for the team of two ‘climbers’ to both get to the top of the mounain.

This is about twice as much fun as it sounds yet it has a very serious purpose. Mastery games can be used by themselves, or can of course be used to prepare for mastery tests.

Research on asking students to generate questions and answers for each other has shown that the approach produces marked improvements in achievement. Why is this?

**12 Concept Map Check**

This has the advantage that it focuses on deep levels of understanding. Also, for learning to go into the long term memory it must be structured first, and this teaching strategy requires students to structure their understanding, and checks this structure is sound.

* Students create their own concept map. After completing a topic, students are asked to complete a ‘concept map’ or spider diagram that summarises the key points and includes the main relations and principles. One way of doing this is to produce a Principle Map, which starts with the main principles, criteria, causes or issues etc and then the rest of the topic is connected to these. An alternative is to ask students to produce the more usual content based map.
* Student compare their maps in groups of about three. They suggest improvements to their own maps, and then to each others.
* The teacher shows their map
* The group notes differences between their maps and the teacher’s map, discuss these, and then suggest improvements to their own maps, and then to each other’s.
* These improvements are made.

This activity can be repeated for the same topic as a review exercise.

**What is so special about Formative Teaching?**

Professor John Hattie showed that feedback had more impact on learning quality than any other single factor. Sadler ’89 analysed feedback to show that for learning to take place the learner needs to know:

* **The goal** e.g. “I need to use the correct method to solve a right angled triangle with trigonometry. I need to use diagrams, and lay out my working correctly, showing the methods and equations I am using, and to calculate with few errors”
* **Their present position**: how far they have achieved the goal. E.g. what they do right and what they do wrong “I use the correct method usually and show my working adequately, my diagrams are clear and I refer to them well in my working.”
* **How to close the gap** between the goal and their present position e.g. “I need to ensure I don’t confuse sines and tangents. I need to be better at splitting up complex diagrams into right angled triangles.”

Formative Teaching Strategies provide these three vital pieces of information, often in a very vivid way. Note that feedback does not need to be provided only by the teacher, indeed it is often best provided by the learner or by a peer. This is because peer and self-assessment are very powerful ways to **clarify goals, show how to improve, encourage the learner to take responsibility for their learning, and create in the learner a belief that improvement is possible.**

# References.

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