Integrating feedback into medical education

Maximizing the potential of feedback requires being receptive to suggestions for change, adapting feedback according to different learning styles, and making the most of new developments. This article provides a foundation in the theory of modern medical education for those receiving or giving feedback at any level.

Understanding how to use feedback makes us more efficient at both learning and teaching, although it is often poorly used. It is important to value feedback in order to maximize the potential for improving one's own performance. This requires being receptive to suggestions for change, adapting feedback according to different learning styles, and making the most of new developments such as blueprinting. This article provides a foundation in the theory of modern medical education for those receiving or giving feedback at any level.

Purpose and cycle of feedback

Feedback is an essential element of the learning process, and research about learning in the clinical environment has shown feedback to be a key factor in achieving learner satisfaction (Peyton, 1998). Feedback is a response to an assessment, which corrects or reinforces an aspect of knowledge, skill or attitude in order to minimize error. The fundamental purpose of feedback is to correct misunderstanding and thereby improve ability.

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The learner corrects previous mistakes by identifying weaknesses and addressing them, as described in the feedback cycle (*Figure 1*). Learners are encouraged to recognize their current ability (individual reflection), what ability is required (contextual reflection), discordance between requirements and their current ability (relational feedback), opportunities to enhance their ability (developmental feedback), and take action to improve their ability (corrective learning). Through this cycle learners are empowered to integrate corrections into the foundation of their existing ability, which become progressively more concrete through reinforcement by positive feedback from repeated practice.

Integration of learning styles

It is important to be aware that the preferred learning styles of those both giving and receiving feedback may differ. If unrecognized, this has the potential to create subconscious preconceptions as to the most efficient way to learn, which can then limit the effectiveness of feedback.

It is widely accepted that there are four distinct learning preferences that are part of a four-stage experiential learning cycle (Kolb and Fry, 1975). This learning cycle consists of an 'immediate or concrete experience', which is the basis of following 'observations and reflections', the area in which feedback is involved. These thoughts are developed and formed into 'abstract concepts' which affect behaviour and are then 'actively tested' which, completing the cycle, form new experiences.

The four types of learning style are a combination of two experiences of learning within this cycle: watching (reflective observation) *vs* doing (active experimentation), and thinking (abstract conceptualization) *vs* feeling (concrete experience).

It is possible to rationalize these stages into two continuums: the approach to a task along the horizontal axis (the processing continuum), and how one contemplates a task along the perpendicular axis (the perception continuum). The learning styles Kolb suggests are combinations of these two axes, and indicate how an individual chooses to experience as he/she learns, for example whether to do or watch, and at the same time whether to feel or think (*Figure 2*). How an individual prefers to approach a task (do or watch) and his/her emotional response to the experience (think or feel) creates one of four distinct learning styles:

1. Diverging (watching and feeling): individuals who look at things from different perspectives, gather information and solve problems. The style is diverging as the learners perform best in situ-

Figure 1. Feedback cycle.

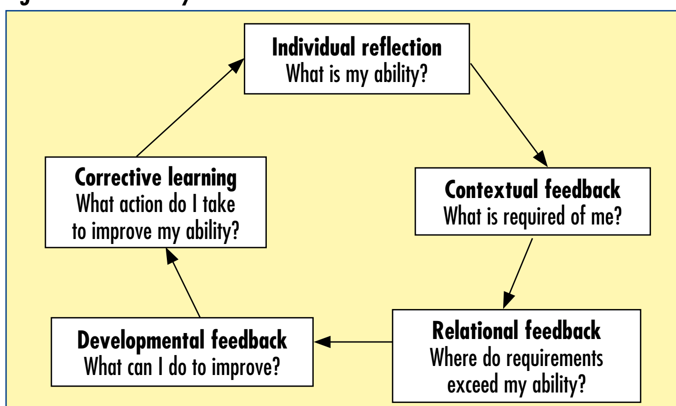
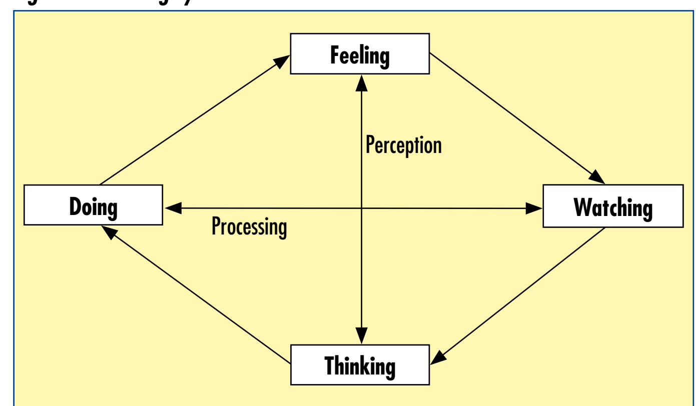


Figure 2. Learning cycle.



ations that require idea generation, and thus they favour teamwork
2. Assimilating (watching and thinking): individuals who value clear explanation with a logical approach to learning rather than a practical experience. Learning is preferred through observing and reflecting on concepts
3. Converging (doing and thinking): individuals who are attracted to technical tasks, and use learning to find solutions to problems. Learning is preferred through practical application and experimenting with new ideas
4. Accommodating (doing and feeling): individuals who use intuition as opposed to logic, and enjoy practical approaches. Learners often rely on others for initial information that they can then analyse, and thus they favour teamwork.

A clear awareness of these different learning styles brings insight that increases the effectiveness of the feedback process. By recognizing a learner as demonstrating an accommodating preference, the teacher will realize the importance of providing initial information that the learner will enjoy reflecting upon him-/herself. In contrast, an assimilating learner will most appreciate an extensive and clear explanation of feedback rather than analysing it him-/herself.

This begins to explain why the demands of the learner vary; some individuals seem to require a deeper level of feedback than others in order to be prompted and equipped to correct their learning. Expressing a desire for more in-depth explanation of errors may be misinterpreted as consumerist behaviour and an unwillingness to work independently, whereas the learner may actively need more guidance to effectively reflect and improve.

Insight into learning styles improves the quality of teaching, as teachers begin to recognize and adapt to the differing styles of learner. The effectiveness of feedback will be greater as the form of information provided becomes increasingly individualized. In addition, those teaching can carry this insight through to their own learning and continuing professional development as they appreciate the best way they can build upon the feedback they receive themselves.

Types of feedback

There are many different forms in which feedback can be delivered. Feedback can be categorized according to each of the following criteria:

- Anonymous or named ownership
- Solicited or unsolicited (requested by the learner or not)
- Face-to-face (usually verbal and transient) or remote
- Narrative or statistical
- Positive (reinforcing achieved objectives) or negative (specifying unachieved objectives requiring improvement)
- Individualized (learner specific) or generic (generalized to cohort; usually enabling placement against peers)
- Teacher-to-learner, learner-to-teacher, peer (for either learner or teacher) or 360° (multi-source sampling of stakeholders, e.g. superiors, peers, subordinates, patients)
- Unidirectional or bidirectional (feedback on the feedback).

Whatever form and method of delivery is chosen, it is important to manage learner expectations regarding the type of feedback that will be received, and to explain the most effective way to use the feedback before it is provided.

In addition, feedback can be regulated by either the person providing it or the recipient. Self-regulated feedback is directed by the recipient's agenda and self-assessment of performance, with the opinion of other people being sought to contribute to problem solving. In pre-planned self-regulated feedback sessions, the input of others can be intentionally provocative (White and Gruppen, 2010), or non-judgemental such as with agenda-led outcome-based analysis (Silverman et al, 1996).

Timing of feedback

A key determinant of feedback effectiveness is the time period after the assessment in which it is provided (Carter, 1984). Timely feedback aids detailed recall (Ende, 1983), and so influences how likely the learner will be to revisit objectives that were not successfully achieved. The more immediately the feedback is offered, the more equipped the learner is to adjust his/her understanding, being able to still engage with how the objectives were assessed.

For summative assessments, the release of grades either before or coincident with feedback can discourage further learning in those who then know that they have passed. Once the assessment has been passed, the 'hurdle mentality' created by a competency-driven modularized educational system encourages closure of learning. However, providing feedback before the release of grades can cause considerable anxiety, as learners may erroneously attempt to use the feedback to ascertain how well they have performed in the assessment. The question of whether feedback should be divorced from grades remains controversial, but giving prompt feedback is widely accepted to take precedence over waiting to release feedback with grades (Race, 2002; National Student Survey, 2010).

Levels of feedback

The different types of feedback all have the same intention, to motivate corrective learning. The level of feedback (Fleming and Levie, 1993) which will most effectively achieve this goal varies depending on the situation:

1. Confirmatory: a pass or fail classification of the assessment objective. This only indicates a difference between the learner's performance and the desired learning objective, without specifying what the difference is. For example, this is appropriate when there is a standard correct procedure of which the learner is already aware, such as an objective structured clinical examination station
2. Corrective description: a classification of the assessment performance, which also specifies the difference between the learner's performance and the desired learning objective. For example, an assessment concerning the location of an anatomical feature in an image could give feedback on the chosen location in comparison with the correct location. This is favoured by diverging learners.
3. Directed explanation: directs the learner to additional information where it is possible to find an explanation for the correct answer. For example, this may be appropriate for multiple choice questions. This is favoured by converging learners.

4. Diagnostic explanation: additional information is provided relating the principles which substantiate a correct answer, encouraging learning by integrating the underpinning theory. This may be useful in feedback for long case-based assessments. This is favoured by accommodating learners.
5. Elaborative explanation: additional information is provided that explains why an answer was incorrect. This will correct the learner if he/she still feels the answer was valid. For example, this is appropriate when correcting the procedure for a patient examination, showing the correct procedure and accentuating the missing or incorrect actions. This is favoured by assimilating learners.

When the level of feedback that is most effective for a specific context is chosen, it identifies the strengths and weaknesses of a learner's performance and encourages further self-learning and improvement. Rather than acting to indicate an end to that area of learning, the feedback should initiate a continuing period of the feedback cycle (*Figure 1*). The more detailed the feedback can be, the better corrected the learner is, as he/she is more equipped to understand the unlearnt material.

Ideally every learner's style should be determined and each learner should receive feedback at the most appropriate level for him/her. Alternatively the lowest common denominator can be used to determine the feedback level, although this may be impractical when some learners require the highest level of feedback with elaborative explanation. A more common approach is to choose the level which is thought to give the most satisfying feedback to the largest learning style population. Another approach is to provide 'nested' feedback, such that confirmatory feedback is delivered to all learners, but more levels are available if the learner desires, creating a layered 'nest' of feedback.

Blueprinted feedback

A blueprint is a technical schematic, depicting the outline of a design and the fundamental links between its components. This concept has recently become interwoven into medical curricula. Medical curricula pivot on the detailed learning objectives associated with each teaching session (Burr, 2009a). Sessional learning objectives map to the module level and in turn to the degree level objectives, ultimately linking to the outcomes specified by *Tomorrow's Doctors* (General Medical Council, 2009). The result is a curriculum blueprint showing what is to be learnt, where and when.

It is similarly possible to map assessment items to their relevant learning objectives, and provide feedback based on whether each objective has been achieved or not (Burr, 2009b; Coombes et al, 2010; Muijtjens et al, 2010). This blueprinted feedback then shows what has been assessed, where and when. The whole process can be computerized, such that mapping the objectives to the assessment items needs to be done only once for each assessment, in order to provide automated individualized emailed feedback to every learner.

The process of blueprinting is therefore highly efficient compared with delivering other forms of detailed feedback. The learner receives a list of objective outcomes ranked and scored according to his/her own personal achievement. This can not only be explicitly linked to required professional outcomes, but can if desired also be coded and stratified according to the importance and difficulty of each item by standard setting (Norcini, 2003).

Because the actual assessment items are not released, blueprinted feedback has the advantage of not compromising examination question banks, so that items retain validity and can be reused to ensure reliability. Similarly, presenting only the objectives focuses subsequent learning on unachieved objectives and away from any extraneous contextual detail in the questions, which may otherwise attract unnecessary learning effort. Even for those who have passed, blueprinted feedback can identify areas of weakness and emphasize the importance of returning to learn a subject after it has been assessed.

Contextualizing feedback

In the clinical environment positive and negative feedback is important as the teacher confirms good practice while bringing errors to the learner's attention (*Figure 3*). It is particularly critical to provide effective feedback on performance when

Figure 3. Illustrations of feedback in practice.

Example 1. Giving unsolicited feedback to a subordinate

A patient was due for theatre and the anaesthetist informed the senior author that the patient had not been clerked nor had bloods taken despite having been admitted the night before. The author was charged with discussing the situation with the junior responsible. When conversing with the junior he confirmed that he had not done the necessary work as he thought someone else could do it, despite it being one of his designated responsibilities. The senior author asked whether the situation was appropriate for the patient; he replied no and stated he was wrong to assume that these tasks would be done by someone else.

When asked how the situation could be improved and prevented from happening again, upon reflection, he proposed that he would apologize to the anaesthetist and surgeon for his oversight, and that in future he would see all patients. Self-reflection is an important stage of the feedback process that should lead to improved future performance.

Example 2. Giving solicited feedback to a peer

A colleague approached the senior author and asked why he had not been given opportunities to practice a technique independently. He confirmed that several seniors had shown him the technique, which he had demonstrated competently and that he had had no disagreements with these seniors. Upon further questioning, he stated that when being shown the technique he always performed it his way because his way was better. When asked whether he had followed the seniors' advice on how to perform the technique, he said no. When then asked whether he had discussed with them why they all did it differently, he said no, they were wrong and he knew better. He did not believe the seniors might have a problem trusting him when he didn't follow their advice.

He then asked for advice and the senior author suggested that his seniors probably don't trust him to do the technique the way that they think it should be done and that he should discuss the justifications for the different approaches with them; he replied that this was wrong. When asked whether he thought it was reasonable for someone to say they have no problem following advice, to ask for advice, and then reject it, he said no, and on reflection he agreed that was what he had just done and had done with the seniors. This demonstrates how critical it is to create a constructive environment when offering feedback to increase the learner's receptiveness to the suggestions.

practicing the adage 'see one, do one, teach one', in order to ensure patient safety when trainees are learning procedures on real patients. All doctors are in a position of great importance as the feedback they give to trainees will guide the medical practice of the next generation of doctors.

There is a need for doctors to both value feedback and be able to use it to best effect. The benefits extend to their own future practice, as a greater understanding of feedback will lead them to more effectively use appraisals and 360° feedback. Furthermore, inviting more feedback from others will maximize the opportunities to develop in preparation for higher professional examinations and maintaining excellence.

Delivering effective feedback

A measure of feedback efficiency can be formed through comparing the payoff for the learner, with the resource efficiency for the teacher (Race, 2002). An awareness of these two aspects develops the teacher's ability to balance feedback quality against sustainable delivery. High resource efficiency requires the maximum practical use of time and materials, for both those giving and those receiving feedback. Additionally, high payoff for learning requires feedback to be complementary to the individual's style of learning, be timely (i.e. as prompt as possible to aid recall), be appropriately detailed according to the feedback level required for the assessment format, and be clearly linked directly to the achievement of intended objectives. To further optimize future efficiency, feedback on the feedback should be both sought and volunteered.

Optimum feedback efficiency requires a structured dialogue, which can take one of several forms (McKimm, 2009): a chronological recital (conveying observations in the order they occurred); a feedback sandwich (in which weaknesses are book-ended by starting and ending with strengths); or following 'Pendleton's rules' (prefacing weaknesses with strengths; Pendleton et al, 1984).

It is possible to construct a clear pathway to motivate learning through feedback (*Figure 4*). In practice it is also important to establish the individual's own perceptions and use these to frame the feedback provided. For example, start with an open question such as 'what do you think you did well?' and use the response to focus constructively on the positive aspects of performance, before asking and feeding back about weaknesses (Pendleton et al, 1984). This is followed by highlighting pivotal misconceptions, eliciting incongruities in the expectations of both sides, and suggesting opportunities for improvement. Taken in combination these stages work together to facilitate learning and the correction of mistakes. Therefore, integrating all of these practices into the daily working lives of doctors should refine the clinical performance of all concerned. **BJHM**

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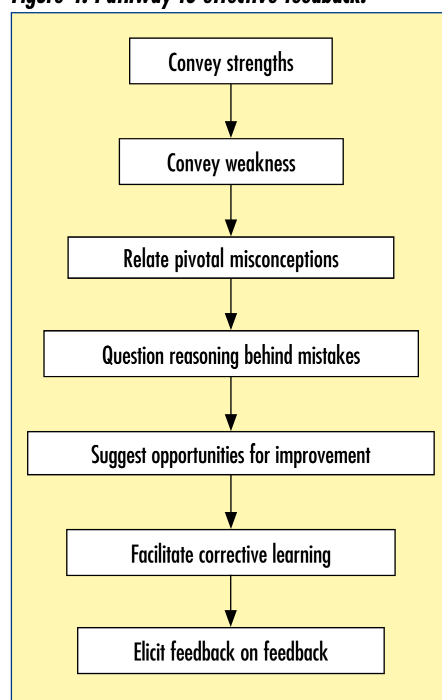
Figure 4. Pathway to effective feedback.



KEY POINTS

The essence of good feedback is that helping others to improve helps yourself:

- Have clear objectives and create opportunities for improvement.
- Ask for feedback on the feedback you give, and give feedback on the feedback you receive.
- Be aware of the potential for incongruity in the preferred learning style of givers and receivers of feedback.
- Adopt feedback approaches which have high payoff for learning.
- Engage with innovations to make efficiency savings.