

Providing feedback on students' practical work

CASE STUDY 5.1.A – DESIGNING A SOCIAL RESEARCH PROJECT

Read this case study and complete the analysis questions below.

Charlotte* is teaching a research lab in a sociology programme where students will learn to do survey research by collecting and analysing data within their university. Students begin with the following task:

You are asked to research the relationship between student gender and integration in university. Define an appropriate hypothesis, and briefly describe a piece of survey research that could enable you to draw valid conclusions about this relationship, clarifying how the research will be designed and conducted ethically.

Noah, one of the students, submitted his hypothesis and survey design last week. Today, Charlotte returns the proposal to Noah as follows:

H₀: There is no difference between the integration of female students in humanities courses and in science courses.

Good, but not "gender and integration"

H₁: Female students are more integrated in humanities courses than in science courses.

Method: Class lists for female students in the Faculty of Arts and the Faculty of Sciences will be obtained. 100 Female students in each faculty will be selected at random. ✓

OK

? Selected participants will be administered the Student Integration Survey ✓
[1]. Data on age, ethnicity, and social class will also be collected. The Social Integration Scores for each will be calculated. T-tests will be completed to assess if social integration is significantly higher in the arts/humanities students than in science students.

Other data ?

? The principal ethics issues are privacy and informed consent. Surveys will be anonymous, and students will be told they don't have to take part if they don't want. t/z ✓

Grade : 6/10

1. Dowalby et al. (1993) THE STUDENT INTEGRATION SURVEY: Development of an Early Alert Assessment and Reporting System. Research in Higher Education p. 513

"But is it ok?", Noah asks her.

"Yes, it's ok, ish", she replies. "You just need to be more detailed and more precise. You are missing some things that ideally you should have spotted".

"Ok. I'll look at it again", says Noah.

Case analysis questions

Write down and keep your answers to the following questions; you will need them in Case study 5.1.B.

1. Imagine you are giving Noah advice based on Charlotte's response to his research design. Based on her feedback, what things could you advise him to do to meet her expectations?
2. What specific advice could you give Charlotte to help her give better feedback to Noah? Try to list at least four things.

* This case is a fictionalised account of teaching experiences.

As with Noah in Case study 5.1.A, people learn when they have an opportunity to try things, to make mistakes, to get feedback on those mistakes, and to try again to get it right. Mistakes during a practical activity, seen in this way, are not a problem in themselves. They are just a part of the process of improving in order to avoid making such mistakes when it really matters. As the playwright Samuel Beckett famously wrote, “Ever tried. Ever failed. No matter. Try again. Fail again. Fail better” (Beckett 1984).

John Hattie, who carried out one of the largest ever statistical overviews of learning, found that feedback on students’ work is one of the teaching strategies that has the strongest effect on student learning. He analysed 23 different reviews of quantitative data on feedback including over 1,200 studies involving almost 68,000 learners. His conclusion was that feedback is “among the most powerful influences on achievement” (Hattie 2009, 173). Although the research evidence shows feedback has huge potential in helping students learn, in many universities this potential is perhaps not being realised. In the UK, for example, the National Student Survey has found that the area of lowest student satisfaction across the higher education sector has consistently been feedback (Beaumont et al. 2011).

This chapter explores how higher education teachers can give feedback in ways that maximise the impact on student learning in practical settings. It identifies that good feedback clarifies what a great answer, product, or performance looks like, tells the student how well they are doing, and identifies how the student can improve. The chapter also looks at how feedback can be provided in ways that maximise the chances that the student will actually take it on board. And it addresses how feedback can be managed when student numbers grow and resources often do not.

Case study 5.1.A provides an opportunity for you to clarify your conceptions about what good feedback looks like. You will then be able to compare your preconceptions with the findings of research on feedback. It is important, therefore, to read Case study 5.1.A and attempt the analysis questions before going further.

HOW DO YOU HELP STUDENTS TO *FAIL BETTER*?

Research on efforts to help students *fail better* highlights that feedback is most effective when it addresses three different things:

- What does a good performance/answer/solution look like?
- How is the student actually performing?
- How can she or he improve?

We will take these three elements in turn.

What does a good performance/answer/solution look like?

First, one of the reasons a student may not achieve an excellent performance on a task is that they might not be clear as to *what a good performance looks like*. It may be that the teacher has told the students the criteria of evaluation, but that a given student, overwhelmed with information, has forgotten. It may be that the student remembers the criteria that the teacher explained, but has not yet realised what this means in the complexity of practice. It may be that the criteria for assessing the students' performances are so obvious to the teacher that the teacher feels there is no need to make them explicit to the students. Whatever the reason, it is frequently the case that students fail to perform well because they aren't fully aware of what *perform well* actually means.

Here are some examples of situations where students could have learned more or performed better if they had properly understood what was required of them (all are based on real examples the authors have encountered in working with teachers):

- Biology students gathered data from an experiment and carried out some exercises using the data. Many of them presented their answers to a precision of two figures after the decimal point (e.g. 4.16 or 314.51) because that was the level of precision they were required to have in previous courses in that department. However, in this experiment, the nature of the measurements used meant that this level of precision was unwarranted. The teacher expected students to report their results to a level of precision that matched the accuracy of measurements, but many students simply followed the procedure that had become their habit in previous courses in that department.
- Students in a teaching practice placement were required to complete a daily *critical reflection* on their experience during each day in school. For the practice supervisor, the term *critical* had a specific technical meaning: that is, that the students use information from peers, learners, and from literature to try to identify their own implicit assumptions about learning and learners (this approach is called *critically reflective practice* in the teaching literature – it will be discussed again in Chapter 10). For many of the students, however, the term *critical* implied first and foremost that they should criticise themselves. They therefore focused their daily critical reflections on what went wrong in that day, and failed to clarify how their own implicit assumptions were impacting on their practice. Their supervisor consequently described their reflections as *superficial*.

- Students studying social research worked in a team to design and carry out an experiment in a lab course. One of the course goals was for students to develop independence and so, when they asked specific questions about their proposed research design, the response from the teacher was often a variant on the phrase “You need to decide if you think that will work well”. Some of the students produced experimental designs which lacked validity and ended up unhappy with their grade because they felt they weren’t told that their project was problematic.

In each of these situations, part of the problem for a student is that they find it hard to produce a good answer or solution because they are not in fact clear as to what *good* actually means in this context. Part of helping people to improve performance, then, is to explain to them what a good performance looks like. It is really helpful to students if the person giving feedback clarifies the criteria *after the student has produced a piece of work* because this is an opportunity for the student to understand not just what the criteria are in abstract but what they actually mean in practice (this implies, of course, that the student should produce some work during the course and not only at the end).

REFLECTION POINT 5.1

Take an example of a student activity in a practical course you have been involved in teaching. Can you identify the criteria that would be used to assess this activity if it were included in an assessment? Try to include any criteria that may be obvious to the supervisor but might not be obvious to the student.

How is the student actually performing?

The second element in effective feedback is clarifying for the student how they have actually performed. Feedback about performance can be given at different levels (Hattie and Timperley 2007), including:

- the specifics of the *task*,
- the *processes* that apply to this task but also apply to other similar tasks,
- the way in which they *manage* their learning or problem solving,
- the *person* themselves.

It is useful to take each of these levels in turn.

Feedback at the level of the *task* is feedback that is specific to the piece of work that the student has produced. Telling the student that their answer is right or wrong is an example of feedback at the level of the task (this kind of feedback is illustrated in Spotlight 5.1.A). Pointing out specific mistakes in their answer is also feedback at the level of the task. This kind of feedback can be welcomed by students; however they may find it difficult to learn a lot from this feedback because they may not see how to apply it in future exercises.

SPOTLIGHT 5.1.A – TASK, PROCESS, OR THINKING?

Farida* is supervising a group project in an engineering programme in which students are required to design and prototype a mobile phone app.

In one session, she sees that students in one of the groups are disagreeing with each other and that students appear frustrated with each other. The students explain that they have multiple suggestions for the design of the home screen on their app, but that they can't agree which one is best.

Farida looks at the various designs and suggests which one she feels is most appropriate, explaining why she thinks it is the better design.

* This is a fictionalised account of teaching experiences.

This is feedback at the level of the task, and it will help the student to solve this specific problem. The student may or may not be able to use this information to better solve future problems. Oftentimes it is not only the answer to a specific difficulty that the student has experienced that they need to know about but also why this difficulty arose. Feedback at the level of the *process* targets the general processes that are used in solving questions *of this type*. If you can start a sentence by saying, "When doing this kind of activity, it is often a good idea to ...", then this could be feedback at the level of the process. An example of process feedback to a group of students working on a design project might be,

When you are designing something, it is often a good idea to spend some time generating lots of different possible solutions before deciding which one to pursue. In your case, you seem to be jumping too quickly to choosing your approach before really exploring the different possibilities in an open-minded way.

Rather than simply telling them that their solution is problematic, this type of feedback explains why the problem has occurred, and how it can be avoided in the future (see, for example, Spotlight 5.1.B).

SPOTLIGHT 5.1.B – TASK, PROCESS, OR THINKING?

Farida says to the students,

When trying to make a decision like this it is often a good idea to use one of the decision-making tools that you have seen in class. For example, in this case you could use a decision-making grid. First, you list the criteria that are important, then decide how much weight you should give each criterion. Then score each option in the criteria. This kind of approach often works when you are working on your own but also when you need to make decisions as a group.

In Spotlight 5.1.B, Farida's response is feedback at the level of the *process*. It is specifically phrased so that the student can see that it doesn't just help them with this problem but it will also help them with other similar problems. Compared to task feedback, the student has a better chance of being able to use this information to solve future problems because it is phrased in a more generalisable way.

The third level of feedback is feedback about how students are *managing* the task or the problem-solving process. Chapter 3 identified that students who can think about their thinking (metacognition) are more likely to develop transferable expertise (this issue is discussed again in Chapters 8 and 9). Sometimes students run into difficulties because they act without really defining their goal, considering what kind of strategy will help them to achieve that goal, and whether or not their current approach is working. Feedback at the level of how to manage their work or learning may help students develop their metacognitive capacities (see Spotlight 5.1.C).

SPOTLIGHT 5.1.C – TASK, PROCESS, OR THINKING?

Farida continues,

Remember that when you are working in industry you won't just need to be able to design mobile apps, but you will also have to

be able to make decisions when there are lots of different criteria – cost, efficiency, effectiveness, environmental concerns, and so on. Some of these criteria might even contradict each other. When you get stuck, ask yourselves, “Is there some strategy or approach we could use to think our way out of this?” And whatever strategy you use, don’t forget to wrap up by asking yourselves if you think the strategy worked well and how you could make it work better next time.

This is feedback to the student that focuses on how to solve the issue of being stuck, that is, feedback at the level of *managing* their own problem-solving or learning process. Implicit in this feedback is the message that the student has the ability to solve the problem, they just need to find the right solution strategy. Since being stuck is a common occurrence, this kind of feedback should be something that the student can apply in numerous situations.

The fourth level of feedback is feedback about the student themselves as a *person*. General statements about the student or their work such as “Great work, well done”, “Good effort” (or, on the other extreme, “You just made a few stupid mistakes”), are all feedback of this type. Positive personal feedback is sometimes given by teachers who want to help students to improve their sense of self-confidence and to keep trying. Although this kind of positive feedback is often well intentioned, the research evidence suggests that it is generally not very effective (Hattie and Timperley 2007, 96). The problem with such general praise is that it often tells the student nothing about what they have done well and how they can improve. The impact of such feedback may also depend on whether or not the student believes that the teacher is simply being nice because the teacher doesn’t think the student can do better. As a general rule then, this kind of general praise of the student as a person will probably not do much to help their learning or future performance. Criticism of the student as a person is likely to have a negative effect and should be avoided.

A better strategy for helping the student develop a sense of persistence is to give them positive feedback that is linked to the task or the process. Remember that feedback should be part of a process where people try, make mistakes, get feedback, and *try again*. Some students may find it hard to try again. If they already lack a belief in their own ability then seeing their mistakes listed out may simply reinforce their negative beliefs about themselves and may lead them to give up more quickly next time. At the same time, students do need to know what their errors are

if they are to correct them the next time – in fact the research evidence suggests that the most effective feedback is often connected with showing a student that they got something wrong when they thought they had got it right (Hattie 2012, 139). Feedback should, therefore, contain some mixture of information about things the student has done well and things that they need to improve.

This focus on encouraging students to try again is also important if students see the task as being a *one-shot* activity rather than as a process that they will have to repeat in future. In the case study at the beginning of this chapter, for example, the student Noah could easily decide that he has completed the initial design and should now move on, rather than repeating the task in order to improve. In an ideal world, your feedback will encourage the student to go back and work through the process in order that they can develop their skill.

You can use the Case study 5.1.B and Reflection point 5.2 to apply the ideas about feedback presented so far. You can get feedback on your own understanding by comparing your answer to the sample responses at the end of the chapter.

CASE STUDY 5.1.B – DESIGNING A SOCIAL RESEARCH PROJECT

Look back on the feedback Charlotte gave to Noah on his research design in Case study 5.1.A.

What information did she give to him about (i) what he has done well and (ii) areas where he can improve?

REFLECTION POINT 5.2

Is it a good idea to give students a grade as part of giving them feedback? In thinking about this, it is worth distinguishing between three different scenarios:

- a) giving feedback to students only in the form of a grade (no comments),
- b) giving feedback to students only in the form of short comments (no grade),

- c) giving the students short comments with a grade.

On average, which of these situations do you think will have the most positive impact on student learning? Write down your answer: (a), (b), or (c).

How can she or he improve?

It has been noted above that feedback has the potential to have a large positive impact on student learning. Unfortunately, feedback often does not have this effect, and teachers will recall situations in which they gave a student feedback on their performance only for the student to make exactly the same kind of mistake the next time.

As was highlighted in Chapter 4, students need to do the work of thinking, using, and applying the information they have received in order to learn. This is as true for feedback as it is for anything else: in order to learn from feedback, students need to actively process the information it contains. This problem is sometimes referred to as a lack of *assessment literacy*; as Berry O'Donovan and her colleagues (2016, 940) have written, "It cannot simply be assumed that when students receive feedback they will know what to do with it".

So how can a teacher get students to engage with the feedback they have received? One strategy, building on the last chapter, is the use of questions like, "Based on what I said, can you identify one or two things that will help you to solve this challenge next time you face it?" It is important to remember, however, that the purpose of such a question is not to test the student on how well they were listening, but rather to move the focus of the conversation on to how the feedback has been understood by the student and how they might use it to improve their future performance.

PUTTING IT ALL TOGETHER

A number of different dimensions of good feedback have now been identified. Effective feedback should make it clear *what good performance looks like*, it should include both positive and negative aspects about *how well the student's work has met this goal*, and, finally, it should indicate *what the student should do in order to improve*. Forward-looking feedback, that focuses on what the student can do next time they encounter a problem like this one, is most

effective for helping students develop skills that they can apply in another situation. The continuation of Case study 5.1.C provides an opportunity to see how these ideas apply in practice by revisiting Charlotte's feedback to Noah. The analysis questions ask you to revisit and question your prior assumptions or conceptions about feedback (you can check your own answers against the proposed responses to the analysis questions at the end of the chapter).

CASE STUDY 5.1.C – DESIGNING A SOCIAL RESEARCH PROJECT

Read this case study and complete the analysis questions below.

Later in the lab session, Noah has had time to think about his feedback from Charlotte and is confused. He prints a clean version of his research design and goes back to her and says "I thought I understood the corrections you gave me, but actually, I don't. Can you explain it to me again?"

She says,

In this kind of activity you should read the task carefully. Here, you need to demonstrate that: (a) you can correctly frame an appropriate hypothesis, (b) you know about threats to validity, and (c) you know what the ethics issues are. All three of those things are mentioned in the task description. As always, you also have to present your work in the right format. That is mentioned in the course description.

"Now, here", she says, marking [1] on the page, "the hypothesis format is correct insofar as it is a testable statement, but it actually addresses if female students are integrated, not whether gender impacts on integration. The problem is there is no data from non-female students for comparison".

"Here and here", she says, marking [2], "you haven't formatted the report correctly. You need to use the Harvard referencing system, not footnotes. You should check the style guide".

"Here", she says, marking [3], "you correctly identify that you can compare the means, but given the sample size it will be a z-test

– practically speaking it is the same thing as a t-test but it is good to be precise in your language”.

Now, this bit is really important. At here and here at [4], you say you will identify the student’s social class, ethnicity, and gender. You will also know her faculty. This means that the person might be identifiable, even if you don’t include her name in the data. Secondly you do actually have her name on a class list – that is more personal data. This is an ethics issue. In fact it is not only an ethical issue but also a data protection legal issue. You have to specify more clearly how you will treat such data.

One last important thing, here [5]. Random selection and adequate sample size are both good. This helps to ensure your claims can be valid. But to have valid findings about how gender relates to integration, you need to control for other factors, like time spent in university. This means you need additional data. You should think about what other data you could collect to address this.

H₀: There is no difference between the integration of female students in humanities courses and in science courses. [1]

H₁: Female students are more integrated in humanities courses than in science courses.

Method: Class lists for female students in the Faculty of Arts and the Faculty of Sciences will be obtained. 100 Female students in each faculty will be selected at random.

Selected participants will be administered the Student Integration Survey. [4, 5]

[2] [1]. Data on age, ethnicity, and social class ~~will~~ also be collected. The Social Integration Scores for each will be calculated. T-tests will be completed to assess if social integration is significantly higher in the arts/humanities students than in science students. [3]

[4] The principal ethics issues are privacy and informed consent. Surveys will be anonymous, and students will be told they don’t have to take part if they don’t want.

1. Dowalby et al. (1993) THE STUDENT INTEGRATION SURVEY: Development of an Early Alert Assessment and Reporting System. [2] Research in Higher Education p. 513

Finally Charlotte says to Noah: “Ok. Based on what I’ve said, how does your answer compare to the criteria?”

Noah looks at the sheet and says,

It's ok for the first one because I wrote the hypothesis correctly, but it is the wrong hypothesis. The second criterion is not ok because I forgot some threats to validity. I know we have a list of those from the lecture. I'll look at that again. And for ethics, I'm probably breaking the law on privacy. Which is not good. I need to fix that.

"Great," said Charlotte. "What will you do to fix this?" Noah responds,

Well, I need to look at the threats to validity from the lecture and go through each one. But can you explain the anonymization thing? I thought once there was no names it was ok, but I guess that was wrong.

"There was a section in the lecture on anonymization and pseudo-anonymization as well, and a protocol to follow", says Charlotte. She continues,

Do the same as you are planning for threats to validity. Look at the lecture notes again and come back to me if you have a problem. And don't forget to correct the referencing format. That is easy to fix.

Case analysis questions

Write down your answers to the following questions. Suggested answers can be found at the end of the chapter.

1. Charlotte explains what good performance looks like for this task. What does she say?
2. What feedback does she give Noah about the specific tasks required in this exercise?
3. What feedback does she give Noah about the processes that he can use to avoid such problems?
4. Compare the ratio of positive to negative feedback, and task to process feedback, Charlotte gave Noah. Do you think that it is a good balance to support learning?

5. How does Charlotte engage Noah in making sense of the feedback?
6. How does she help him focus on what he needs to do to perform better next time?
7. Look back at your answer to question 1 in Case study 5.1.A. How is it similar to or different from the advice you would now give to Noah based on Charlotte's second feedback? What does that tell you about the utility of Charlotte's first set of feedback?
8. Look back at your answer to question 2 in Case study 5.1.A. How do you now evaluate the advice you would have given to Charlotte before you read this chapter?

COMMUNICATING HIGH EXPECTATIONS TO EVERYONE

It is evident from Case study 5.1.C that in Charlotte's second attempt at feedback she tried to communicate to Noah what an excellent answer would look like rather than what a *good enough* answer looked like. Educational researchers have long realised that one of the causes for comparatively poor performance is that teachers sometimes implicitly communicate to some students that they actually don't expect too much from that student (e.g. Rosenthal 1994). This can happen through various mechanisms such as asking fewer questions or easier questions, or giving some students less thinking time after asking a question (these mechanisms were discussed in Chapter 4). It can also happen through teachers giving students they consider as weak more praise and less direction than other students. It appears as if teachers are often unaware that they are communicating lower expectations to some students because they are themselves unaware of the biases that are influencing their behaviour.

The effect of such implicit biases on students in university has been researched. In one study, published in 2012, Corinne Moss-Racusin and her colleagues sent a student CV to 127 faculty members. Everyone got the same CV except for one detail: for half of them the student had a masculine name (*John*), and for the other half the student had a feminine name (*Jennifer*). Teachers were asked to rate the student's suitability for a job in a lab in terms of their competence, hireability, and the salary they should receive. The results showed that, although the CVs were identical except for the

name, teachers scored *John* higher than *Jennifer* on all criteria. Female faculty were just as likely to exhibit a bias in favour of *John* as were male faculty. The report's authors conclude:

Because most students depend on feedback from their environment to calibrate their own worth, faculty's assessments of students' competence likely contribute to students' self-efficacy and goal setting ... which may influence decisions much later in their careers.

(Moss-Racusin et al. 2012, 16477–8)

The bias identified in Moss-Racusin et al.'s study is probably implicit – the person holding the bias may not even be aware of it. It is unlikely that such biases are simply a generational effect of older teachers: one recent study found similar biases in third- and fourth-year male and female students in project teams, but found that students themselves were generally unaware of their own biases (Aeby et al. 2019). Implicit biases have now been widely studied and have been found, for example, to explain in part why it is that a gender gap in science and math achievement is found in some countries but not in others (Nosek et al. 2011). An online self-test for implicit biases has been developed at Harvard and can be accessed at the *Project Implicit* site (<https://implicit.harvard.edu>). It is probably a good idea for any teacher to take such a self-test to give themselves feedback about their potential implicit biases and to help them ensure that they communicate high expectations to all students.

HOW AND HOW OFTEN?

It is evident in Case study 5.1.C that when Charlotte gave better feedback to Noah she had to provide more detail and it took longer. It may be hard, therefore, to see how it would be possible to give good feedback *at scale*.

While there are definitely technological solutions that can help to give feedback at scale, the research evidence suggests a number of things that can also be done when giving *human* feedback. First, while Charlotte wrote a lot on Noah's sheet, the research evidence suggests that oral feedback can be as effective as, or more effective than, written feedback (e.g. King et al. 2008). Berry O'Donovan and her colleagues (2016), for example, suggest that *quick and dirty* feedback on lab reports delivered one-to-one by assistants during a lab session may be a more efficient use of the assistant's time than written feedback on formal lab reports handed in some time after the lab has finished.

A second useful finding from research is that oftentimes peers can give each other useful feedback. How peer feedback can work in practice is illustrated in Spotlight 5.2. Asking students to give each other feedback can be particularly effective if it is used as a way of making them more familiar with what the criteria for excellent performance look like in practice. However, it is generally not recommended that you just leave students to give feedback to each other without guidance (Hattie 2012). John Hattie recommends that if you do get peers to give each other feedback, you should use some questions or prompts to guide their feedback. Suggested prompts include:

Task level

- ☐ What knowledge/skills is the student supposed to demonstrate in this activity?
- ☐ How well was each skill demonstrated?
- ☐ Were mistakes made and if so, what were they?

Process level

- ☐ Are there things to keep in mind when working on problems or tasks like this one?
- ☐ Did the approach taken maximise the chances of being successful in the task?

Management of thinking level

- ☐ Did the student consciously chose a strategy or approach to the task or was it chosen by *intuition*?
- ☐ Were there moments of being stuck and if so what was the response?
- ☐ Were different approaches to completing the task considered before choosing one?
- ☐ Did the student evaluate their own performance, and how could they have done so?

SPOTLIGHT 5.2 – PEER FEEDBACK IN THE DANCE STUDIO

As Chapter 2 discussed, higher levels of performance in a range of artistic domains, including dance and music, have been found to be associated with learners who engage in deliberate practice. Given

the focus on practice for improvement, work by Heidi Andrade and colleagues (2015, 47) has argued

Feedback from the dance community, including peers and teachers, is important to students' growth as dancers, so formative assessment can be seen as an integral part of the creation and performance of dance. Fortunately, teachers are not the sole source of feedback in the classroom: when self- and peer assessment are carefully taught and guided ... constructive and focused feedback can come from students themselves.

In Andrade et al.'s test of the impact of peer formative feedback in the dance studio, students were provided with peer feedback sheets which specified the criteria for a given activity and which required peers to give each other positive and more critical feedback. For example, an activity which involved practising three kinds of falls from a standing position specified that there were some features shared by all three falls (e.g. falling silently, safely, and in one's own space) and some criteria which depended on the type of fall (*falling with a floating quality* for a light fall as compared to *falling with a strong quality* for a heavy fall). Peers observed each other, wrote positive feedback ("I like how ...") and more critical feedback ("I wish ..."), then sat in pairs to discuss. In these discussions, students learned how to ascribe meaning to and take ownership of the language of the class (i.e. terms like *floating* and *strong*).

The feedback sheet also asked students to plan for improvement ("I am going to improve my light fall by ..."). Students were able here to make explicit the areas they needed to work on (such as, for a light fall, "When I fall, do it quicker and do it in sequence").

The same process of (i) clarifying the criteria, (ii) identifying positives, (iii) identifying critical points, and (iv) identifying ways of improving, was used repeatedly throughout the term.

The teacher in this case identified that the peer feedback was generally well received by students and that there were clear improvements in the groups' performances. There was also a growth in collaboration among students. In summary the researchers concluded that the process enabled the creation of "cultures of critique"

in the dance classroom: “Developing such environments allowed students to comfortably provide and receive useful feedback, set goals for their work, and increase their engagement in and learning about dance and choreography” (Andrade et al. 2015, 54).

This feedback experience is valuable because it clearly describes the ways in which peer feedback was structured in order to make it as useful as possible. Although Andrade et al.’s work describes feedback at pre-university level, peer feedback is also seen in higher education. Louise Kelsey and Lise Uytterhoeven (2017), for example, describe peer feedback at a university-level choreography course. In order to enable productive feedback within the group, students used Adshead-Lansdale’s Dance Analysis model which involves first describing the dance, then discerning its form, interpreting it, and then analysing. This framework was used because it was suitable for students of all ability levels and developed the analysis skills of the observer as well as providing feedback to the observed. Kelsey and Uytterhoeven conclude, “Reflection on peer, self and tutor feedback, plus on that from external visitors, helps students, as Hinett recognizes, ‘develop interpersonal skills, improve confidence and sustain motivation for their studies by monitoring and taking responsibility for their own development’” (2017, 44).

TEST YOURSELF

The exercises in this section provide an opportunity for you to apply the concepts and ideas outlined in this chapter to a practical laboratory scenario. Sample answers are provided at the end of the chapter.

CASE STUDY 5.2 – HOW TO KILL BACTERIA

Read this case study and complete the analysis questions below.

Janna and Thierry* are working as lab partners on the bacterial cell viability experiment. The problem statement for the lab activity is as follows:

Bacteria are known to be able to survive a range of conditions; however, they are not immortal. What conditions do you expect

to kill bacteria? What can bacteria survive? Please generate 1–2 testable hypotheses and design an experimental protocol that will allow you to test each hypothesis. Plan to make multiple observations to improve the measurement precisions. Use the list of materials available from the supply room to plan your experiment but keep health and safety and environmental concerns in mind, and get approval from the lab assistant for your procedure before taking anything from the supply room.

Janna and Thierry present their procedure to the lab assistant, Wei.

~~Alcohol~~
~~Salt??~~
Detergent
Lead

Hypothesis: Does lead kill bacteria? Does detergent kill bacteria?

Transfer 25 mL bacterial cell suspension solution to 4 sterile vials. Label them A, B, C + D

Add 2 drops of detergent to 2 vial A+B. Add 0.1g lead to vials B+C.

Place vials in a 25 deg C water bath and incubate for 8h. Swab each vial to growth medium and allow to the bacteria to grow for 12h. Measure bacterial density optically and calculate growth rates to compare the 4 different conditions.

A key goal of this exercise is for students to learn to work autonomously to develop an experimental protocol to test specific hypotheses. Wei is relieved that Janna and Thierry have finally written down their procedure, as they have been asking him questions continuously since the beginning of the session.

Case analysis questions

The analysis questions can be answered without any technical knowledge in chemistry or life sciences using the information in this case study. Write down your answers to the following questions. Suggested answers can be found at the end of the chapter.

1. Reading the problem statement and the other information contained in the case study, what are the criteria that are used to define an excellent experimental protocol in this class?

2. Wei identifies that the protocol is likely to give some interpretable results and should be able to answer the problem statement. He also identifies a few difficulties: first, the hypothesis is phrased as a question rather than as a testable statement; second the protocol has only a single observation of each condition and not multiple observations; third, the use of lead has environmental and potentially health and safety implications which are not referred to in the protocol. Using this information, what kind of feedback should he give Thierry and Janna about the *process* involved in solving a problem like this?
3. Could Wei offer students any feedback about the way in which they are *managing* their problem-solving process (hint: look back on the prompts that can be used to guide peer feedback)?
4. What positive feedback could Wei give to Thierry and Janna?
5. How much positive and negative feedback should Wei give? What factors should be taken into account in deciding this?

* This case is a fictionalised account of teaching experiences.

ACTION SUMMARY – FEEDBACK

- Clarify the criteria of assessment for the student; they may not know or understand what *good performance* looks like in practice.
- Include some positive and some critical elements in feedback.
- Feedback about the specific task is OK, but feedback that is about *problems like this one* (process feedback), or about how to manage learning and problem solving may be better.
- Feedback about the student as a person is best avoided.
- Feedback looks to the future: focus on what the student will do next time they face this problem rather than exclusively talking about what they already did.
- Consider using (well-structured) peer feedback or technological tools to generate useful feedback for students in larger groups.
- Communicate high expectations to all students, being particularly attentive to areas where implicit bias may result in unintentional messages.

CONCLUSION

As a teacher, feedback to students on work they have produced is potentially one of the most powerful tools in your armoury. Practice in labs, projects, studios, and field placements plays a very important role in higher education and, through the right kind of feedback, students can be helped to see how they can improve their performance as they practice.

It is important to note that there are a number of qualifiers in the previous paragraph: feedback is *potentially* important, and students can improve through *the right kind* of feedback. Sometimes students do not recognise feedback as feedback, especially if it is obscured by grades, if a time lag means that it arrives after they have mentally moved on to the next task, or if it refers only to the specific task in a particular problem that they will never have to face again. Feedback of this type is a recipe for frustration both for the student (who doesn't improve) and for the teacher (who has wasted their time on generating unused feedback).

But providing the right kind of feedback is feasible. It is possible to communicate high expectations to all students by clarifying the criteria for a great performance, by pointing out specific achievements as well as areas to improve, and by focusing on what students can learn from their mistakes that can be applied in other problems *like this one* in the future.

Giving feedback on work students have produced is the second tool in your armoury as a practical teacher, alongside prompting students to think for themselves by asking good questions (described in Chapter 4). The next chapter turns attention to a third teaching skill: explaining and demonstrating to students in ways that will help them learn.

FURTHER READING

This small number of sources is intended to provide further useful information for those who wish to explore the chapter topic in more detail. A full reference list for the chapter is provided below.

Methods for generating effective feedback

- Petty, G. (2009). Feedback methods: Assessment for learning. In: *Evidence-Based Teaching* (pp. 245–274). Thornes: Nelson.
- Stevens, D. D., and Levi, A. J. (2013). *Introduction to Rubrics: An Assessment Tool to Save Grading Time, Convey Effective Feedback, and Promote Student Learning*. Stylus Publishing, LLC.

Strategies for integrating effective feedback in teaching activities

- Irons, A. (2021). *Enhancing Learning Through Formative Assessment and Feedback*, 2nd edition. London: Routledge.
- Wisker, G., Exley, K., Antoniou, M., and Ridley, P. (2008). Work-based learning and keeping personal development portfolios. In: *Working One-to-One with Students: Supervising, Coaching, Mentoring, and Personal Tutoring*. London: Routledge. <https://doi.org/10.4324/9780203016497>.

Research evidence on using feedback

- Hattie, J. (2018, September 18). John Hattie: Visible learning feedback webinar [video]. *YouTube*. <https://youtu.be/RfHQAQCAqtw>.
- Hattie, J., and Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77(1): 81–112. <https://doi.org/10.3102/003465430298487>.
- Petty, G. (2017). Presentation and activities based on Black + William's (1998) study at King's College. <https://www.teacherstoolbox.co.uk/black-and-william-1998/>.

ANSWERS TO SELECTED CHAPTER ACTIVITIES

These sample answers are provided to allow you to generate some feedback for yourself. You should take time to complete the activities before comparing your answers with our ideas.

Case study 5.1.B

Charlotte appears to give Noah positive feedback about his hypothesis and method, but says that he needs to be more precise and fix some details.

Reflection point 5.2

John Hattie and Helen Timperley, in their review of the evidence, concluded that research on giving grades or comments “showed that feedback through comments alone led to learning gains, whereas marks alone or comments accompanied by marks ... did not” (2007, 92). Therefore the answer to the question is (b).

Feedback is only going to be effective if the students process the information it contains. Since students often want to know first and foremost how they scored, giving them a mark or grade may satisfy their curiosity. If students get only comments and no grade it may be that they will be more

motivated to read the comments carefully in order to figure out how they did. Giving comments without a grade, may, therefore, encourage student to engage more with the feedback.

Case study 5.1.C

1. Charlotte outlines what good performance on this task looks like in paragraph 2 of the case study.
2. Charlotte gives Noah positive task-related feedback in paragraph 3 and negative task-related feedback in paragraph 4.
3. Charlotte doesn't directly give Noah process-related feedback, but rather tells him to review his lecture notes to clarify what is needed, including how to ensure validity and protect participants' data.
4. Charlotte provides more negative than positive feedback, but the research design is an early draft, Noah does not seem discouraged, and since he also leaves with specific strategies to improve his research design, the result is probably that Charlotte has communicated high expectations.
5. Charlotte asks Noah to assess his own answer based on the criteria she lists. She also asks him what steps he will take to improve his research design.
6. Charlotte makes her assessment criteria explicit and also discusses with Noah the specific steps he can take to improve his design.

Case study 5.2

1. An excellent protocol in this circumstance would have the following characteristics:
 - a. One to two testable hypotheses.
 - b. An experimental protocol that will actually test those hypotheses.
 - c. Multiple observations of each condition and a method for dealing with potential measurement errors.
 - d. Avoiding the use of materials or methods that will have safety risks or a potentially negative environmental impact.
 - e. Developing these hypotheses and protocol while working without significant assistance.
2. There are a number of different process elements Wei could identify:
 - a. In problems like this, the criteria are made clear in the problem statement so it is important to read it carefully. Perhaps underline key words and phrases when you first read it, then, at the

- end, check the protocol against the problem statement to see if you have done what you have been asked.
 - b. There are often multiple possible ways of testing a hypothesis. The challenge in questions like this is to decide which one is the best one. You should weigh up the pros and cons of different possible protocols before deciding which one best meets the criteria.
3. There are a number of things Wei could give feedback on about the management of their process:
 - a. Designing an experiment generally requires some creative thinking to come up with different options, and then some critical thinking to analyse the possibilities and chose the best one. It can be useful to be clear with yourself about which kind of thinking you need to do and when. Janna and Thierry have generated a number of options (creativity) but haven't necessarily evaluated them against all the required criteria (critical thinking).
 - b. Janna and Thierry asked a lot of questions rather than working autonomously as required. Do they know why they ask so many questions? What do they need to do to be better able to troubleshoot this kind of lab exercise on their own?
 - c. The final answer does not appear to have been checked against the criteria in the problem statement. It is useful for students to remind themselves that *the solution is not finished until it is checked*.
4. In terms of the task, the hypotheses are quite close to being testable statements and do not need much work to improve them. The protocol has included clear and appropriate control and experimental conditions. The protocol is written in a way that makes it reproducible (it is clear in terms of quantities, times, and temperatures, for example). In terms of their process, it is clear that Janna and Thierry did try to brainstorm a little before choosing some options; this strategy is generally the right one for questions of this type, they just need to improve on their analysis and decision making.
5. Wei's interaction with Janna and Thierry led him to have low expectations of them. He may be tempted therefore to over-praise them. He should certainly identify their strengths as well as weaknesses, but he should try to ensure he is clear about expecting an excellent answer from them as much as from anyone else.

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