

2018-11-02

Components of, and Approaches to, Effective Feedback

Sarah Gibbons

University of Limerick, sarah.gibbons@ul.ie

Jonathan McCarthy

Technological University Dublin, jonathan.mccarthy@tudublin.ie

Paul McEvoy

Technological University Dublin, paul.mcevoy@tudublin.ie

See next page for additional authors

Follow this and additional works at: <https://arrow.tudublin.ie/ltcpgdprp>



Part of the [Higher Education and Teaching Commons](#), [Other Teacher Education and Professional Development Commons](#), and the [Scholarship of Teaching and Learning Commons](#)

Recommended Citation

Gibbons, S., McCarthy, J., McEvoy, P., Mordaunt, P. (2018) *Components of, and Approaches to, Effective Feedback*. Practitioner Research Project, DIT, 2018.

This Report is brought to you for free and open access by the Learning Teaching & Assessment Programme Outputs at ARROW@TU Dublin. It has been accepted for inclusion in Practitioner Research Projects by an authorized administrator of ARROW@TU Dublin. For more information, please contact arrow.admin@tudublin.ie, aisling.coyne@tudublin.ie, vera.kilshaw@tudublin.ie.

Authors

Sarah Gibbons, Jonathan McCarthy, Paul McEvoy, and Patricia Mordaunt

Components of, and approaches to, Effective Feedback

Sarah Gibbons*, Jonathan McCarthy, Paul McEvoy**, Patricia Mordaunt****

*** University of Limerick (www.ul.ie)**

****Dublin Institute of Technology (www.dit.ie)**

Introduction

Feedback is the subject of much research and discussion in Higher Education. Nationally the focus has intensified due to reports of low levels of student satisfaction with the feedback process e.g. the Irish Survey of Student Engagement (ISSE). The focus of this project is an examination of effective feedback in undergraduate education. The importance of effective feedback (particularly for those beginning their third level education) is reflected in a project funded by the National Forum for the Enhancement of Teaching and Learning, called the Y1Feedback project. This is aimed at increasing the quality of the third level experience and has gained a national and international profile. The provision of feedback to students is particularly worthwhile, and it has been demonstrated that the “provision of timely and useful feedback has significant potential to support and improve student learning (Hounsell, 2003, Hattie & Timperley 2007, Sadler 2010, Carless *et al.* 2011, Merry *et al.* 2013)” (Y1Feedback, 2016 p.6).

The challenges with third level feedback have been well documented and fall into two broad categories, those which prevent students from engaging meaningfully with feedback (Nash & Winstone, 2017) and those which prevent educators from delivering effective feedback. These include student numbers, workload, confidence in technology, timing, format, regularity, and access to feedback (Y1Feedback, 2016). Feedback is often offered to students in a linear manner from educator to student, resulting in students having limited responsibility in the process. Many students do not know how to engage with the feedback process. Introducing the approach of dialogic feedback means that teachers are no longer the sole source of feedback, and peer and self-critical feedback should build skills towards self-regulation of learning (Y1Feedback, 2016, p.18). Students may not pay attention to feedback comments because they cannot make sense of them (Duncan, 2007), and Spiller (2009) emphasises that students often do not understand the feedback process.

This report will outline the key components of an effective feedback process and mechanisms which can be considered in implementing effective feedback. The intention is to offer a simplified, student-centred approach to assist educators when designing or revising feedback practices.

The research and group report culminated in a website representing the feedback approach we have critiqued and developed:

<http://www.feedback.mccarthywebsites.com/>

Literature review - Components of effective feedback

As part of our research we have reviewed five prominent feedback models which describe components and processes of effective feedback. "Using feedback from teachers does not come naturally to all students" (Brookhart, 2017, p. 58). Brookhart (2017) describes how timing, quantity, mode and audience work as feedback strategies. Using these does not guarantee success unless these strategies are carefully considered and planned to ensure the feedback offered is effective. To complement this, the feedback content should have focus and relevance (Brookhart, 2017). Educators need to consider:

1. Model giving and using feedback yourself.
2. Teach students self and peer assessment skills.
3. Be clear about the learning target and the criteria for good work.
4. Have students develop their own rubrics.
5. Design lessons in which students use feedback on previous work to produce better work.

The process will help students to understand how to receive and use feedback, and this should help move towards self-assessment (Brookhart, 2017) and ultimately self-regulation. This literature review considers the following feedback models, which represent the complex components of feedback. The significant points of each are captured in the following section. Butler and Winne (1995, p. 246) conceptualise feedback through a self-regulatory approach to learning. Their concept of self-regulation is a style "of engaging with tasks" where students are capable of setting goals to help "upgrade their knowledge". To fuel these self-regulated activities feedback is the "inherent catalyst". They have described the traditional form of feedback in education and how it seeks to either "confirm or change a student's knowledge as represented by answers to test or assignment questions". They propose positioning feedback within a model of self-regulated learning. This empowers the student to fundamentally understand how and why they are performing a specific task. This can allow students to set goals to measure learning and performance goals.

Nicol and Macfarlane-Dick (2006, p. 205) offer seven principles of good feedback practice which advocate students having a proactive role in generating and using feedback. Their self-regulated learning approach is similar to the position of Butler & Winne (1995). "Good feedback practice is broadly defined here as anything that might strengthen the students' capacity to self-regulate their own performance" (Nicol & Macfarlane-Dick, 2006, p. 205).

Hattie and Timperley (2007) describe a similar framework to Nicol and Macfarlane-Dick (2006) and offer a model of feedback that is aimed at reducing the disparities between understanding and goal setting. Their model contends that effective feedback should inform the path to goal completion, including goal articulation, future direction, and appraisal of the feedback landscape. These components help identify gaps in the learning process, encouraging students to increase their effort in order to close the gap.

Nash and Winstone (2017) have identified the barriers that affect students' interaction with feedback and suggest that responsibility sharing places a responsibility on progress with both student and educators. This needs to be fulfilled for the feedback process to be effective.

The main components of our composite framework are as follows;

1. Comprehension of the process and its purpose

It is clear from the models researched that students need to be made aware of feedback, what it is, what it is for, and what their role in the process is. Brookhart (2017, p. 59) suggests an educator should demonstrate giving and receiving feedback and teach students self and peer assessment skills. Hattie and Timperley (2007, p. 104) describe the purpose of feedback as being the reduction in the discrepancies between current understanding/performance and a desired goal. Nash and Winstone (2017, p. 1) specify the need to describe what feedback is and explain the shared responsibility between educator and student in the feedback-learning cycle.

2. Assessment and Goal-setting

It is essential to establish the criteria for good work. Students need to be cognisant of the goals, criteria, and expected standards. The educator must set assessments describing the required goals and level of standard (Hattie & Timperley, 2007), it is not sufficient to set isolated assessments. Assessment must provide an appropriate challenge for learners and contain very specific goals (Butler & Winne, 1995). Similarly, assessment helps establish what progress is being made. Feedback strategies should be selected depending on assessment type and the needs of the student.

3. Feedback Strategy

Central to an effective strategy is the identification of performance gaps. Feedback offered to students should be educative and focus on what has been done correctly and what is needed to improve their performance (Brookhart, 2017). One of the main issues with feedback can be timeliness. The feedback should be prompt to support learning while the student still remembers completing the assignment task (Nash & Winstone, 2017). This is a main feature and has been identified in some form in all feedback models reviewed. The feedback strategy needs to suit the students' needs and to help measure performance and offer advice on how to improve (Hattie & Timperley, 2007). One of the major issues identified with the traditional "transmission view" of feedback is the lack of understanding regarding current performance and good performance (Hattie & Timperley, 2007, p. 94). Students have difficulty comprehending goals and expectations from "statements of expected standards" (Yorke & Knight, 2004, p. 480). Additional strategies are needed to bring the students into the area of marking, goals, and expectations. Nicol and Macfarlane-Dick suggest the use of exemplars as mechanisms for positive change as "they define a valid standard against which students can compare their work" (2006, p. 206).

4. Teach the tools to self-regulate

The ultimate aim of effective feedback is to allow the student to progress to self-regulatory learning. The responsibility for learning shifts, from educator towards student. In order for this to happen the educator must teach the student how to use feedback effectively and the student must take increasing responsibility for scrutinising their work and applying the feedback strategies (Nash & Winstone, 2017) Using feedback strategies to measure performance requires student understanding of what is expected of them. Brookhart (2017) suggests including students in the development of grading rubrics. This brings the student into the evaluation space and offers the ability to compare current work against expected standards. This is a fundamental shift towards self-regulated learning.

Approaches to effective feedback

There are a range of approaches to the delivery of effective feedback which are discussed in the *Y1 Feedback Synthesis of Literature* and include informal feedback, peer to peer and peer reviewed feedback, marking guides, rubrics, and exemplars, in class dialogue and feedback, separating grades and feedback, feed forward strategies, generic feedback, anticipatory feedback and programmatic approaches (Y1Feedback, 2016, p. 24-31). This section will examine how combining the requisite technological tools with these approaches can address many of the difficulties around students accessing feedback. For the purpose of this project, three approaches are discussed, with a more detailed synoptic table adapted from the Y1 Feedback project provided (Appendix C).

Written feedback

Feedback in the form of written comments and notes on students' work is the most usual and favoured type of feedback at undergraduate level, "written feedback was popular. When explaining this preference, the student's highlighted attributes such as the permanence of the text and the use of written comments as an 'aide memoire' [study aid]." (Y1 Feedback 2016, p. 39).

Technology provides staff at third level with increasing ways to provide written feedback. Word processing applications have the ability to offer feedback by adding comments or annotations to documents. Comments can also be added via apps that allow you to hand write comments with a stylus and then convert them to text. Virtual Learning Environments such as Blackboard, and Moodle, provide easy and effective ways to create reuse and adapt marking guides. These applications facilitate the provision of timely feedback by allowing lecturers create banks of frequently used comments. Using technology to provide written feedback to students can be beneficial to students and lecturers. There is an initial time investment to learn an application or create banks of comments and rubrics, but in the long run lecturers save time as marking and providing feedback can be completed more quickly, improving the timeliness and quality of written feedback.

For students, technology enabled written feedback is more legible, more timely and can be more easily accessed and revisited or reviewed at any time. While students have identified that they have a preference for written feedback, the issue of illegibility is frequently cited as a problem (Carless 2006, Agius and Wilkinson 2014, Sopina and McNeill 2014 as cited in Y1Feedback, 2016).

Audio and Audio-Visual feedback

In terms of delivering effective feedback, bigger numbers create greater difficulties. Delivering quality feedback in a timely manner to large student groups is extremely challenging. Providing feedback via audio, audio-visual or screen cast can offer significant advantages for staff and students.

One case study in the Y1 Feedback Project, demonstrated the use of audio and audio-visual feedback for large group feedback. Screen casts using Camtasia technology was used to deliver feedback to a group of 490 students. This approach "had the effect of democratizing the process of giving feedback. All students could access the video, and could do so without

coming on campus or attending during office hours. They could also go back to it repeatedly if they wished. (Corcoran, 2017, p. 2).

The Y1 Feedback Project (2016, p.43) notes the benefits of audio, audio visual, and screen cast feedback which increases student engagement with feedback and supports the understanding of it. It also allows for a more immersive feedback experience for the user, as a result of greater control over the process. Research in this area is ongoing and centred on increasing the quality of the interaction and promoting interactive encouragement (Anson, Dannels, Laboy, & Carneiro, 2016). A view echoed by Donnelly et al. who has suggested that a combination of aural and typed feedback can lead to increased levels of inclusion (McDonnell, Donnelly & McAvinia, 2015).

A number of studies however, have found that it is important to consider the student's emotional response when using audio or audio-visual feedback. "...the increased intimacy of the audio feedback may make some points more difficult to hear: 'audio feedback was easier to put into context with what was being said and how because of tone of voice, etc. However, I find criticism easier to take when I'm reading it' (Munro & Hollingworth, 2014, p. 873).

Peer feedback

In line with a preferred move towards a dialogic approach to feedback, peer feedback has multiple positive attributes. The benefit to students' learning is the receipt of constructive feedback and "dialogue in-task rather than just at the end of a task" (Y1Feedback, 2016, p. 52). The Y1Feedback (2016, p. 26) project noted a number of benefits of peer feedback which include;

- efficiencies for volume of feedback and timeliness
- peer-to-peer language can be easier for students to understand
- the process of giving and receiving feedback supports learning
- bringing learning into the public domain
- scaffolding towards self-regulation.

The use of peer feedback has been criticised because of students' lack of feedback literacy, the disruption of power relations between student, teacher and peers, and the time investment for all parties (Liu & Carless, 2006). However, it is clear that the use of any effective feedback mechanisms require front-loading on the part of the lecturer. For peer-to-peer feedback to be effective "you first have to explain to students what it is, why you're doing it and how it will work, then provide them with opportunities to acquire the relevant assessment (and feedback) skills" (University of Reading, 2017).

The most common implementation of peer feedback involves students, usually single peers, using pre-specified criteria to assess their peers and assign marks or grades, often providing additional written feedback to that given by the tutor (Ashenafi, 2017).

Peer Mark is a technological tool used through Turnitin, where several automated choices and allocations are arranged. For teachers, the feedback task is set up in Peer Mark, automated choices are made about when students submit their work and when they review others work. Teachers can structure peer feedback by including questions to prompt

students' reflection on their peers' work. These prompts can be added to a 'question library', or via a scale of responses.

The University of Strathclyde have written about their experience using this software with first year students (N82) and "the majority of students (86%) confirmed that their peer review experience had been positive and 76% of participants "reported that they would definitely elect to participate in a future peer review exercise" (Nicol et al., 2014, p. 108).

Conclusion

Feedback is an essential element of the learning cycle and if used correctly has the potential to be a powerful influence on learning and achievement. We have seen that all the models reviewed are dialogic in nature, starting with a conversation about the purpose of feedback and culminating in the creation of a self-regulated learner. A move away from linear models of feedback, towards a dialogic process, holds benefits for both student and lecturer. The implementation of such a model and some of the approaches outlined would require an initial investment of time but we believe it would save time in the long run and add to the sustainability of the process.

Our research has also shown that the feedback process is not always successful, and this has been documented, particularly in relation to unrealistic goal setting (Carver & Scheier, 1990), and the fact that self-regulation is not to be confused with self-direction. Autonomy is not always the best way forward and negative motivation or evaluation may cause a learner to decouple from the process entirely (Butler & Winne, 1995).

However, the current focus on feedback is likely to remain as educational institutions are focusing more and more on transparency, student centred learning, and dealing with the growing prevalence of "justification" as a specific paradigm (Slowey, Kozina, & Tan, 2014). We hope our paper and artefact are useful resources which will help undergraduate lecturers adopt an effective approach to feedback which will improve the learning experience of the student and result in useful information which will help inform lecturer's future teaching.

References

- Anson, C. M., Dannels, D. P., Laboy, J. I., & Carneiro, L. (2016). Students' perceptions of oral screen cast responses to their writing: Exploring digitally mediated identities. *Journal of Business and Technical Communication, 30*(3), 378–411.
- Ashenafi, M. M. (2017). Peer-assessment in higher education—twenty-first century practices, challenges and the way forward. *Assessment & Evaluation in Higher Education, 42*(2), 226–251.
- Brookhart, S. M. (2017). *How to give effective feedback to your students*. ASCD.
- Butler, D. L., & Winne, P. H. (1995). Feedback and self-regulated learning: A theoretical synthesis. *Review of Educational Research, 65*(3), 245–281.
- Carless, D., Salter, D., Yang, M., & Lam, J. (2011). Developing sustainable feedback practices. *Studies in Higher Education, 36*(4), 395–407.
- Carver, C. S., & Scheier, M. (1990). *Principles of self-regulation: Action and emotion*. Guilford Press.
- Corcoran, M. (2017). General Feedback on Exam Performance. In *Technology-Enabled Feedback Approaches for First-Year: Y1Feedback Case Studies in Practice: Y1Feedback*.
- Duncan, N. (2007). 'Feed-forward': improving students' use of tutors' comments. *Assessment & Evaluation in Higher Education, 32*(3), 271–283.
- Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 81–112.
- Hounsell, D. (2003). Student feedback, learning and development. *Higher Education and the Lifecourse, 67–78*.
- Liu, N.-F., & Carless, D. (2006). Peer feedback: the learning element of peer assessment. *Teaching in Higher Education, 11*(3), 279–290.
- McDonnell, C., Donnelly, R., & McAvinia, C. (2015). *An Evaluation of Formative Audio Feedback Within Part Time Professional Development Programmes in DIT*. Ed-Tech2015 Conference, University of Limerick, Ireland, 29-29 May.
- Merry, S., Price, M., Carless, D., & Taras, M. (2013). *Reconceptualising feedback in higher education: Developing dialogue with students*. London: Routledge.
- Munro, W., & Hollingworth, L. (2014). Audio feedback to physiotherapy students for viva voce: how effective is 'the living voice'? *Assessment & Evaluation in Higher Education, 39*(7), 865–878.
- Nash, R. A., & Winstone, N. E. (2017). Responsibility-sharing in the giving and receiving of assessment feedback. *Frontiers in Psychology, 8*, 1–9.
- Nicol, D. J., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in Higher Education, 31*(2), 199–218.
- Nicol, D., Thomson, A., & Breslin, C. (2014). Rethinking feedback practices in higher education: a peer review perspective. *Assessment & Evaluation in Higher Education, 39*(1), 102–122.
- O'Regan, L., Harding, N., Brown, M., Maguire, M., Munro, M., McDermott, G., Gallagher, G. (2016). Y1Feedback-The Story So Far: Progress and Reflections from an Irish Multi-Institutional Learning and Teaching Enhancement Project. *AISHE-J: The All Ireland Journal of Teaching and Learning in Higher Education, 8*(3).

- Sadler, D. R. (2010). Beyond feedback: Developing student capability in complex appraisal. *Assessment & Evaluation in Higher Education*, 35(5), 535–550.
- Slowey, M., Kozina, E., & Tan, E. (2014). Voices of academics in Irish Higher education. *Perspectives on Professional Development*. Dublin: AISHE.
- Spiller, D. (2009). Assessment-Feedback to Promote Learning. *Teaching Development, The University of Waikato*.
- University of Reading. (2017). Why should I use peer assessment? Retrieved from <https://www.reading.ac.uk/engageinassessment/peer-and-self-assessment/peer-assessment/eia-why-use-peer-assessment.aspx>
- Y1Feedback. (2016). *Technology-Enabled Feedback in the First Year: A Synthesis of the Literature*. Retrieved from <https://www.teachingandlearning.ie/wp.../2016/10/SynthesisoftheLiterature2016.pdf>
- Yorke, M., & Knight, P. (2004). Self-theories: some implications for teaching and learning in higher education. *Studies in Higher Education*, 29(1), 25–37.

Appendix A

Comparison Matrix

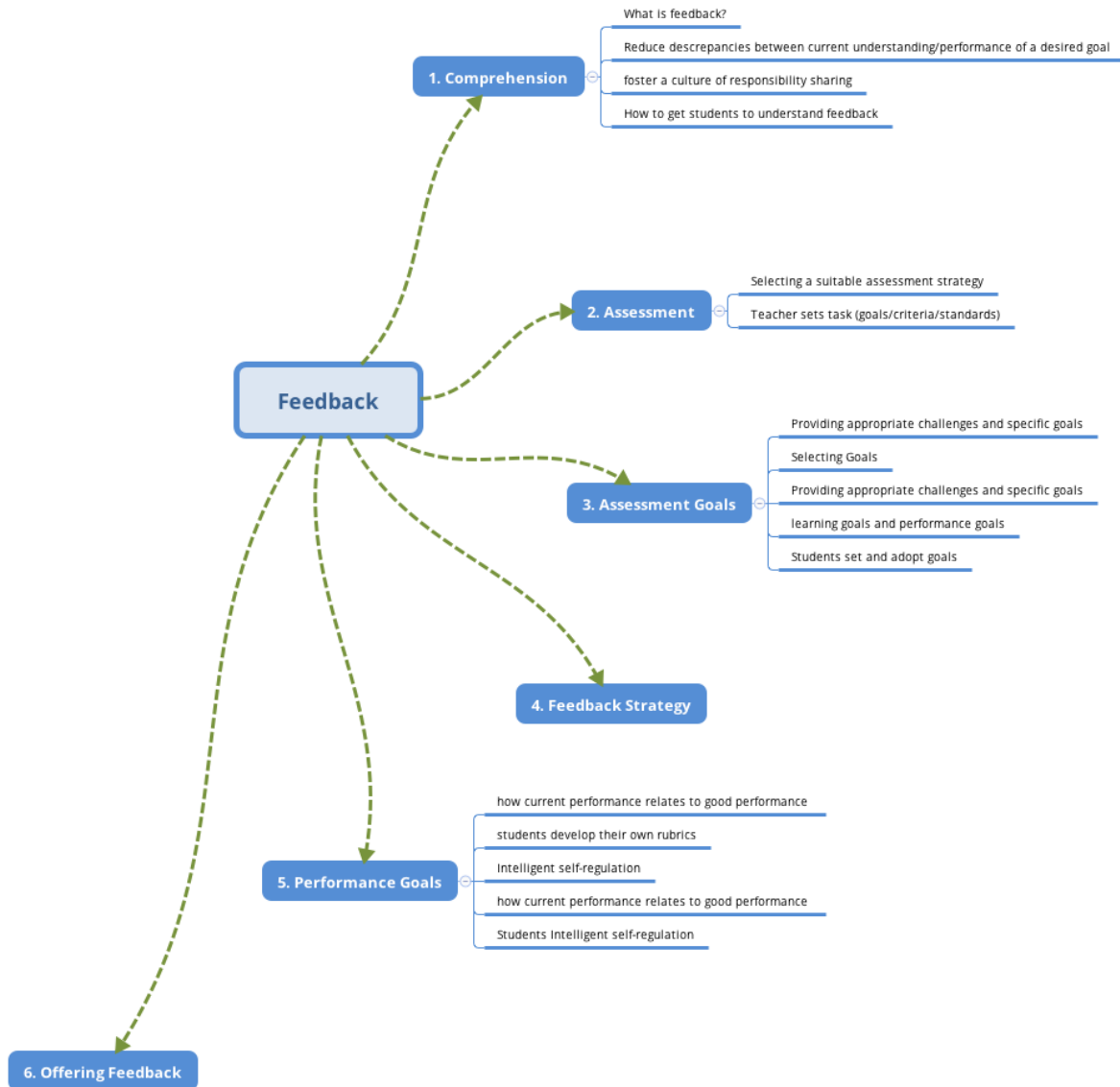
The comparison matrix was used to identify the components of effective feedback. This matrix followed the output from the mind map. The different feedback traits identified in the mind map were listed and a comparison was conducted to find the components of effective feedback.

Feedback Models Comparison Matrix					
Issues	Models				
	Brookhart	Butler & Winne	Nicol & Macfarlane-Dick	Nash & Winstone	Hattie & Timperley
1 Issues with current Transmission View feedback	Yes	No	Yes	Yes	No
2 Student not at the center of the feedback process	Yes	Yes	Yes	Yes	No
3 Responsibility sharing not evident (Student and Educator)	Yes	Yes	Yes	Yes	Yes
4 Students not understanding what feedback is and how to use it	Yes	Yes	Yes	Yes	Yes
Features on Models					
1 Explain to students what feedback is and why its useful	Yes	Yes	Yes	Yes	Yes
2 Describe to students up front how the feedback process will work	Yes	Yes	Yes	Yes	Yes
3 Educator must select a suitable assessment and strategy	Yes	Yes	Yes	Yes	Yes
4 The assessment should provide appropriate challenges and specific goals	Yes	Yes	Yes	Yes	Yes
5 The educator must define performance goals and make this clear to students	Yes	Yes	Yes	Yes	Yes
6 Are students included in the aspects of grading work?	Yes	No	No	No	No
7 A feedback strategy must be selected and the approach clearly defined	Yes	Yes	Yes	Yes	Yes
8 Feedback offered to students	Yes	Yes	Yes	Yes	Yes
9 Self reflection by educator on process followed	Yes	Yes	Yes	Yes	Yes

Appendix B

Mind Map

A mind map was created to explore the different models of feedback and to get an overview of the components of effective feedback. The mind map was created in our group sessions and the literature review conducted fuelled the discussion and the creation of the mind map. Following this process helped to identify some of the common components in offering feedback.



Appendix C

Synoptic Table

Below is a synoptic table, adapted from the Y1 Feedback project, of technological-enabled feedback approaches to feedback.

Technology to support feedback	Features	Tools
<p>1. Technology enabled written feedback p.38</p>	<p>Hand-written comments and annotations are perhaps the most familiar way of providing feedback on students' written work.</p> <p>Example: Uni of Auckland, Sopina & McNeill (2014) - students engaged more with electronic submission and return, hand-writing being cited as problematic.</p> <p>Potential Affordances and Benefits as well as Challenges are discussed plus e.g. of 1st year psychology students & the use of Turnitin Grademark's QuickMark, saving time.</p>	<ul style="list-style-type: none"> ● Word-processing software facilitates the typing of comments on a document and also includes review features such as track changes, comment bubbles, and notes (Crossouard and Pryor 2009). ● Similarly, tools such as the textbox, highlighter, comment box, and pen available in Portable Document Format (PDF) editors, can be used to provide feedback by annotating PDF files. ● Use of a stylus on the screen ● VLEs such as Moodle and Blackboard, as well as specialised systems such as Turnitin GradeMark, include the facility to create, reuse and adapt rubrics and marking guides. ● Use of comments from a comment bank which can be created in VLEs such as Moodle, Blackboard and Turnitin. The comments are then positioned on the relevant section of work.
<p>2. Audio and audio-visual feedback (p.43)</p>	<p>Audio feedback is a recording of aural feedback on student work, sometimes referred to as feedback podcasts.</p> <p>Audio-visual feedback incorporates both aural and visual elements, for example a video of a teacher communicating feedback to a student, or group of students, or a screen cast that combines audio feedback with visual annotations to a student's work.</p> <p>E.g. using Wimba Voice tool through the VLE.</p>	<ul style="list-style-type: none"> ● Personalised and conversational nature of audio and audio-visual feedback can support students' comprehension of, and engagement with, feedback. ● Voice nuances help with understanding and engagement as does use of the student's name but negative feedback can be hard to hear. ● 10 times more likely to download and listen to audio feedback than collect written feedback. ● Various studies have reported that students perceive audio and audio-visual feedback to be of a better quality than written feedback. ● More likely to include suggestions as to how to improve student work (feed forward), since such comments can be quicker and easier to narrate than to write down. ● Audio and audio-visual feedback may offer potential for generating economies of scale in the context of provision of generic feedback to large groups (Cann 2007, Crook et al. 2012).
<p>3. Peer feedback technologies (p.52)</p>	<p>Opportunities for peer feedback have increased considerably with the growth of new technologies, and a number of digital tools can now be used to help students</p>	<ul style="list-style-type: none"> ● Turnitin Peer Mark software – e.g. given where students provided feedback but not an actual mark and found the experience very beneficial. ● Peerwise (https://peerwise.cs.auckland.ac.nz/) is an online tool that can be used to support

	<p>provide both formal and informal formative feedback on each other's work. The most common implementation of peer feedback involves students, usually single peers, using prespecified criteria to assess their peers and assign marks or grades, often providing additional written feedback to that given by the tutor (Ashenafi 2015). This type of peer feedback can now be facilitated through the standard features of most VLEs. In addition, specialist peer marking and feedback tools such as WebPA from University of Loughborough (http://webpa.ac.uk/) and Peer Mark from Turnitin (http://turnitin.com/), have been developed, which help with online collection and collation of peer marks in a confidential, secure environment.</p>	<p>students in the creation, sharing, evaluation, and discussion of multiple choice questions – e.g. introductory physics.</p> <ul style="list-style-type: none"> ● Peer feedback assists in the move towards self-regulated learners. ● In many respects digitally enhanced peer feedback is still in its infancy.
<p>4. E-portfolios (p.58)</p>	<p>E-portfolios may have potential to foster student engagement with feedback. Ability for students to map their activities and achievements to the institution's graduate attributes. E-portfolios may offer particular benefits in relation to self-reflection and self-regulation.</p>	
<p>5. Automated feedback tools (p.62)</p>	<p>Applications have begun to emerge that can provide feedback on students' free text responses. Automated testing is not in itself a dialogic approach. By paying attention to the context in which they are used, online quizzes can be used to foster dialogue.</p>	<ul style="list-style-type: none"> ● For longer pieces of work, tools such as Open Essayist (http://www.open.ac.uk/researchprojects/safesea) and Write Lab (https://www.writelab.com) have recently been developed to provide students with automated feedback on longer pieces of text. ● Tools such as Virtual Programming Lab (http://vpl.dis.ulpgc.es) and Web-CAT (http://web-cat.org) can be used to provide computing and engineering students with automated feedback on the quality of their programming code.

<p>6. Classroom response systems (p.66)</p>	<p>Most often colloquially referred to as 'Clickers'. Can support increased student engagement, particularly in a large group setting. Students can anonymously test their knowledge and receive feedback, not just on their own knowledge, but also on their performance relative to their peers (Beatty 2004).</p>	<ul style="list-style-type: none"> ● Clickers allow students the same anonymity of a paper and-pen approach, while making the process of gathering 'muddiest point' information significantly faster for lecturers. ● Using mobile phone technology, which students typically already possessed, reduced the cost of CRS polling, and saved time in relation to distributing and collecting clickers.
<p>7. Learning analytics (p.71)</p>	<p>According to Gašević, Dawson and Siemens (2015: 65) learning analytics is "a bricolage field drawing on research, methods, and techniques from numerous disciplines such as learning sciences, data mining, information visualization, and psychology". There is general consensus that the term operates on a number of levels: the institution; the faculty or department; the programme leader or individual lecturer; or the learner, depending on particular goals and objectives. Some issues remain about the use of student's data for these purposes. A one-size fits all approach does not exist.</p>	<ul style="list-style-type: none"> ● Student interactions with major IT systems that help to identify patterns, better understand problems, inform student support interventions, and aid decisions on resource allocation (Gašević et al. 2016). ● The focus is on the role of the lecturer in the early detection of students at risk of attrition or failure and the importance of personalised feedback and related interventions. ● Predictive Analytics, a proactive approach to predicting behaviour and implementing appropriate learning interventions that target specific groups of students (van Barneveld, Arnold and Campbell 2012). ● E.g. DCU and PredictEd p.72 - based on levels of engagement with institutional VLE and a prediction of how students will do as a result of this. 3% better performance amongst students who opted in. ● NMC Horizon Reports contain a number of examples of institutions that are using learning analytics. ● Self-regulatory pilot using these data is underway in DCU. The UK Open University has a much larger project underway using regular dashboard updates. This is based around 4 pre-defined pedagogical designs.