

An exploration of using examples and non-examples to develop the skill of critical thinking in students

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Introduction

In the context of fast-paced and social media driven news and information consumption, the central importance of developing the ability of students to think critically is difficult to overstate. It is vital that students receive an education that includes the teaching of critical thinking that moves beyond the assumption that students will acquire these skills incidentally and instead explicitly, and carefully, teaches students how to think critically. To inform this aspirational goal, we engaged in modest practitioner-based research to explore some possible methods for teaching critical thinking skills using examples and non-examples.

We conducted our practitioner-based research at Brisbane Adventist College (BAC), which is located on the border between Mansfield and Wishart in the southern suburbs of Brisbane City Council. BAC is a medium sized, P-12, college of around 600 students who come from a range of cultural backgrounds. Over the past two years we have been supported by Independent Schools Queensland (ISQ) to investigate ways to improve the quality of feedback students receive during the preparation for their summative assessments. Our participation allowed us to engage in targeted professional development about student-centred feedback, from which we then supported our colleagues through a process to implement this approach across our college

Assessment feedback principles

The Hattie and Timperley (2007) feedback model features a feedback cycle, in which teachers provide feedback to students that answers three questions: (i) *Where am I going? (The learning goals)*, (ii) *How am I going? (The current progress in relation to the learning goal)*, and (iii) *Where to next? (The*

steps that need to be taken in order to move from the current progress through to the learning goal). This cycle is sometimes referred to as *Feed Up / Feed Back / Feed Forward*. Providing feedback to students that address these three questions is very teacher-centred in that it requires teachers to invest considerable time and energy into providing quality guidance to students which is, too often, either ignored by the student, or not understood by the student (Brooks et al, 2021). By contrast, Brooks et al (2021) suggest that increasing student participation and involvement in monitoring their progress should reduce the workload for teachers while improving the quality of student responses.

It has long been recognised that a student can, and should, be involved in self-monitoring their progress. For example, Sadler (1998) argued that self-monitoring against the marking criteria is a skill that can be taught to students. A major problem, though, is that students are prone to considering their work to be of a higher quality than it might be. This is compounded by the fact that many students, particularly those with attention or language difficulties, often do not understand what an assessment task is requiring them to do (Graham, et al., 2018). While Graham et al. (2018) highlight the important work to be done in improving the clarity and accessibility of assessment, we posit that providing students with examples and non-examples will supply students with additional support to understand the requirements of a task.

The generation and provision of examples and non-examples has the potential to be yet another teacher-directed process. Instead, it is preferable that students should be active agents in the feedback cycle and not passive recipients of teacher-directed feedback (Brooks et al., 2021). One way of involving, and engaging students, in the feedback process is to develop their assessment feedback competence by co-constructing success through the examination

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of carefully selected examples and non-examples of each of the skills and concepts related to an assessment (Brooks et al., 2021). A key skill identified in the Australian Curriculum as a general capability is creative and critical thinking. Recognising the importance of creative and critical thinking, we wanted to determine if the principles of student-centred feedback could be applied to developing this crucial skill. In particular, we wanted to create a collection of examples and non-examples that could be used with students to develop their critical thinking skills and to evaluate student and teacher views regarding the effectiveness of these examples and non-examples.

Teacher professional development principles

In addition to our focus on using examples and non-examples with students to develop their critical thinking, we wanted to engage our teaching colleagues in ways that would affect lasting change. The work of Guskey (2002) indicates that teachers are more likely to change their beliefs about classroom practices when they observe positive changes in student learning outcomes. Consequently, we recognised a need to provide opportunities for teachers to experience success, and to hear about success, as we worked together to implement the student-centred feedback technique of examples and non-examples. It is also known that teachers possess independently developed and contextually specific understandings about the content and skills of their teaching areas and how to go about teaching those content skills, these understandings are collectively referred to as pedagogical content knowledge (Loughran et. al., 2012). Of relevance to our project, then, was how to develop critical thinking pedagogical content knowledge. Hegazy et. al., (2021) report on a series of team-based action research projects that were effective at developing critical thinking pedagogical content knowledge. Our project sought to provide teachers with opportunities for success by engaging them in professional learning team practitioner-based research focused on the use of examples and non-examples.

The process

The modest practitioner-based research that our college engaged with was implemented in the following way. Each of the steps are linked to the guiding principles outlined in Section 1.

Step 1: Learning about student-centred feedback

As part of our participation in the ISQ supported project, we, the authors of this paper, participated in two days of intensive professional development. The professional development was delivered by Cameron

Brooks and focused on the student-centred feedback model that he had developed. Over the course of these two days, two members of The University of Queensland Science of Learning Research Centre alongside the ISQ personnel supporting this project worked with us to refine the focus of our research project. This process helped develop our understanding of the principles of effective feedback as described in Step 1.

Step 2: Development and trialling of examples and non-examples

Each of the authors of this paper developed and trialled the use of examples and non-examples in their individual classrooms. This allowed us to begin to develop our pedagogical content knowledge about how this technique could be used effectively within our own teaching domains.

Step 3: Feeding forward to our colleagues

The authors of this paper drew on the professional learning we had received, and the experience we had developed in our respective classrooms, to prepare and present a professional learning community presentation to our colleagues. Our candid reflections on how we were going with our implementation of student-centred feedback allowed us to identify the learning and practice gap in reference to where we wanted to go. In particular:

- we shared specific examples of how we had used examples and non-examples in our classrooms;
- what we had found to be successful and what needed more thought or development;
- and what we considered to be the goal, namely developing students who are able to monitor their own progress and take the necessary steps to move towards their learning goals.

As part of this presentation, we outlined the focus of our professional learning community and constituent teams for Semester 2. The focus was to develop examples and non-examples to support students with the Australian Curriculum's general capability of creative and critical thinking. This was presented as a natural progression from the Semester 1 focus on the literacy general capability.

Step 4: Professional learning team time

In order to support teachers and provide "space" for them to work on the focus area, professional learning team time was provided to the teams. The professional learning teams were primary stages and secondary learning areas. On our secondary

“Our project sought to provide ... professional learning team practitioner-based research ... on the use of examples and non-examples.”

campus, many teachers work across departments, so the teams were assembled around a common focus subject with teachers only expected to work in one team for this project. Four weeks of professional learning time over the course of semester 2 was allocated for teachers to complete the following procedures:

1. Use the ACARA Creative and Critical Thinking Learning continuum (ACARA, n.d.) to select a skill to focus on. The teaching team was able to draw on their pedagogical content knowledge of the skills gaps (or misconceptions) that they commonly encountered in their classrooms to select a target skill.
2. Develop some examples and non-examples that illustrate a relationship to the selected skill. The teaching teams again drew on their understanding of the common skills gaps to either select student work that illustrated a particular skill gap or to develop their own examples and non-examples that illustrated this skill gap.
3. Decide as a team how to use the examples and non-examples in their classrooms. One of the key tasks for each team was to determine where in the teaching and learning cycle they would use the examples and non-examples and how they would go about using them. For example, a team might choose to provide the examples and non-examples as a static wall poster or the team might have a lesson in which they model a process done well and not well and then ask the students to respond with an explanation of why the non-example was not effective. The exploratory nature of our study was designed to both collect samples of examples and non-examples and also to collate techniques of how they were used.

Step 5: Professional learning community sharing time

In order to share the experiences learned and develop a greater shared understanding of the use of

examples and non-examples, a professional learning community meeting was allocated for each of the teams to present what they had done. This type of sharing session has been introduced recently in our college and we have found that they are a great opportunity for teachers to share and to hear success stories.

The products

All teachers in our college worked on producing examples and non-examples relating to critical thinking in their classes. The authors of this paper produced the following categories of examples and non-examples.

Year 1

Teachers of Year 1 produced a wide range of examples and non-examples that were used in class. The examples and non-examples were used in conjunction with the question “Which is more effective?”. This provided opportunity to highlight to the class the features of the example that made it more effective than the non-example. Some of the areas that the Year 1 teachers produced examples and non-examples for were:

- Use of descriptive verbs in a procedure (See Figure 1)
- Handwriting (See Figure 2)
- Categories of shapes
- Descriptive writing
- Diorama construction

Year 5

The team members working in Year 5 chose to focus on the critical thinking skill “Evaluate procedures and outcomes”. They asked their students to interact with written examples and non-examples of writing. This allowed them to further develop earlier work from our literacy focus. The students had to analyse the supplied texts against a writing check list and reflect on the positives and negatives. The writing checklist

- | | |
|--------------------------|---|
| 1. Put on the icing | 1. Place the cake on a plate. |
| 2. Put on the sprinkles. | 2. Spread the icing on the cake. |
| 3. Put on the candle. | 3. Shake the sprinkles onto the icing. |
| 4. Eat the cake. | 4. Push the candle into the icing. |
| 5. Finished. | 5. Now your birthday cake is ready for the party! |

Figure 1: Example and non-example of the use of descriptive verbs. The highlighted descriptive verbs were revealed to the students after they had a go at identifying the features that made it more effective.

“students had to analyse the supplied texts against a writing check list and reflect on the positives and negatives.”

included points on the text structure and language features needed in persuasive and informative writing.

English

The team member working in English provided to students some examples and non-examples relating to their advertising unit. As part of their summative assessment students had to produce an advertising poster. To inform their poster, a commercial poster and a sample of previous student work (See Figure 3 and Figure 4) was provided to them. They also had to critique advertisements and were provided with examples and non-examples of a critique.

Science

The science teachers focused on the critical thinking skill "Evaluate procedures and outcomes". They had observed that students struggled to identify error sources within experiments that impacted the quality of results. To remedy this, they produced a series of videos of themselves conducting experiments, well and not well, that they were able to show their students in class (See Figure 5 for a sample of one of the videos). The videos were presented in class during the period of time before the submission of their summative assessment. The students had to identify and list from the videos experimental errors and describe the possible impact of these errors on the experimental results.

Evaluating the effectiveness

To assess the effectiveness of this approach in teaching critical thinking, selected students from each of the author's classes responded to questions about the use of examples and non-examples. The authors of this paper also responded to some questions relating to our experience in this project.

Student questions

Three of the authors of this paper selected students from their respective classes to respond to questions about the use of examples and non-examples. The students were selected based on their likely ability to provide meaningful answers that could identify both

what had been effective about using examples and non-examples and also what was not effective.

The questions the students were given follow:

1. What does success look like in this task?
2. How do you know?
3. Remember when we looked at the example and non-example, was that helpful? Why? How?
4. Did you compare your work to the example and non-example?
5. What did this show you? How are you going? What can you improve?

Of the three teachers who collected student responses, one teacher collected written responses from 11 of their students, one teacher transcribed the spoken responses of two of their students and the other teacher transcribed the spoken responses of the four students who were interviewed simultaneously. The responses were then reviewed with a view to identifying benefits and opportunities arising from the use of examples and non-examples.

Teacher questions

In addition to gathering the perspective of our students, we also reflected on the process within our own classrooms. The following questions were sent

“Selected students from each of the authors' classes responded to questions about the use of examples and non-examples.”



Figure 3: A sample non-example poster.



Figure 4: A sample poster demonstrating effective communication techniques. Retrieved from: <http://www.eriandiles.com/guide-dogs>

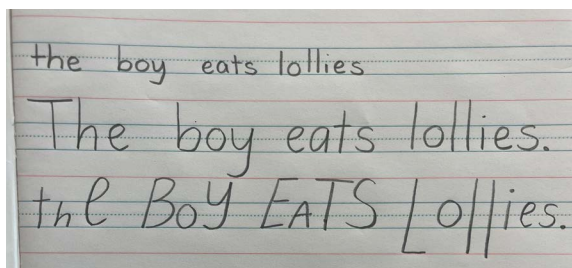


Figure 2: Handwriting examples and non-examples



Figure 5: Single frames illustrating non-example and example from one of the videos produced by the science teachers.

to all the authors of this paper:

1. What did you learn about making examples and non-examples?
2. Did you find it easy? What were the challenges?
3. How did you implement them in the classroom?
4. Do you think it was effective (with reference to student work)? What did you notice?
5. What advice would you give to another teacher about using examples and non-examples?

Written responses were collected from four of the five authors of this paper. The responses provided useful information but due to the relatively low number of responses analysis via thematic coding or word clouds was not possible. Instead, the responses were reviewed and key insights were identified and collated.

Results

Overall, both teachers and students considered the use of examples and non-examples to be useful.

The written teacher responses identified the following:

1. That misconceptions/problems/common mistakes are the key to developing non-examples.
2. Examples and non-examples can be used across all subject areas to teach critical thinking skills.
3. Students used both the examples and non-examples to compare with their work, although students preferred the examples.
4. Three of the four teachers responding to the written questions could identify improvements in student work following the use of the examples and non-examples in their classes.

In a similar way, the responses from the students also identified the benefits of examples and non-examples. Students appreciated having concrete

examples (and non-examples) that helped them to visualise what the teacher was talking about. One of the sentiments that was shared by the group of four students was that they found the examples to be more useful than the non-examples. This sentiment motivated a critical reflection on our experience of applying this technique, and this is discussed in the next section.

Implications for teaching and learning

Our exploratory study has deepened our understanding of assessment and how to support students to also better understand that assessment. The following implications are offered showing how our experience in this project could influence both our future practice as educators and also the practice of our colleagues across the education system.

1. Constructing non-examples is a useful exercise for teachers to support thinking about common misconceptions. The key to developing a good non-example is to identify the common mistakes or misconceptions that are evident in student work. The teacher can select a sample of student work that illustrates this misconception. The sample can be used as an illustration provided there is no way for the student to be identified. One way to do this is to combine work from multiple students. Alternatively, the teacher might produce a non-example that illustrates the misconception. We consider the initial challenges in identifying the common mistakes to be a key part of making the often implicit pedagogical content knowledge explicit and that by implementing responsive strategies within a team their pedagogical content knowledge is further developed and expanded.
2. We would like to see the examples and non-

“
The key to developing a good non-example is to identify the common mistakes or misconceptions ... evident in student work.
”

examples, that our team and our colleagues have produced this year, form the start of an expanding bank of examples and non-examples. Each of the examples and non-examples would be attached to some recommended methods for using them in the classroom. Future research could, and should, investigate the effect of using these resources on both the academic achievement and the assessment self-efficacy of students.

- Teachers should consider methods that make the non-examples as useful to students as the examples. The sentiment noted in the results (item 3) suggests that both our selection of non-examples and the way we were using them in our classrooms was not providing as useful learning for our students. Instead, students should be able to articulate from a non-example the reason why it is partially correct and identify the key skill lacking in the non-example. In the language of Hattie and Timperley (2007) the development of instructive non-examples is about reducing the gap between the example and the non-example so that the non-example becomes an instructive illustration of a misconception or skill.

Conclusion

Our modest practitioner-based exploration of the use of examples and non-examples to teach the Australian Curriculum general capability of creative and critical thinking:

- Found that examples and non-examples can be constructed to teach critical thinking with teachers
- Developed some practice-based examples of how to use examples and non-examples to teach critical thinking.
- Found that students find them to be a useful technique for helping to unlock what success looks like.

On the basis of this, we encourage our teaching colleagues to consider the use of this strategy within their own classrooms. **TEACH**

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