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Teacher use of genre pedagogy: Engaging students in dialogue about content area language during text deconstruction

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Abstract

Research from the fields of science representation, genre pedagogy and disciplinary literacy for adolescents indicates that achievement for students, including those from linguistically diverse backgrounds, will improve if they engage with the meaning-making conventions of disciplinary texts, but there is no current agreement on the nature of teaching practices for supporting such work. This paper reports on the pedagogical changes that occurred when a high-school biology teacher was supported to develop knowledge about systemic functional linguistics and to use genre pedagogy. The case study of one biology teacher discussed here demonstrates that student participation in dialogue about the language patterns of scientific texts improves when the teacher uses genre pedagogy during text deconstruction. Student involvement in dialogue about content area language increases when the teacher focuses on specific parts of texts, prepares students for what to look for within texts, and elaborates on student input. Preparation included converting language to everyday meanings, while elaboration involved recasting to academic language, as well as prompting to reword and expand meaning.

Keywords: genre pedagogy, science representation, systemic functional linguistics, classroom dialogue, CLIL

Introduction

Research across genre pedagogy, disciplinary literacy and representation in science emphasises that the disciplines students encounter in schooling are socio-cultural constructions that require specific ways of making meaning if students are to be successful. Tytler (2007), working in the area of representation in science, explains that student success depends on the ways in which the teacher scaffolds students into the 'very powerful discourses of the scientific culture' (p.34). Moje (2008, 2015), as well as Shanahan and Shanahan (2008), from the perspective of disciplinary literacy, argue that student success depends on the teacher being able to provide an apprenticeship into the discourses of the various disciplines. Similarly, researchers studying genre and functional language emphasise how student achievement occurs when teachers enable students to access the key linguistic elements of a disciplinary context (Rose & Martin 2012).

Researchers within the fields of science representation, genre pedagogy and disciplinary literacy agree that student academic success within disciplinary contexts requires that learners are given opportunities to analyse conventions for meaning making. Those working within science education draw on Latour's (1999, p.30) work to argue that doing science involves making 'representations' of the world and that students require time and support to inquire into the ways in which visual and written texts represent scientific concepts (Tytler 2007; Waldrup & Prain 2013). Those working within disciplinary literacy agree that engaging students in analysis of the kinds of texts valued within a particular discipline context is essential for student achievement. Moje (2007, 2008, 2015), argues that through the analysis of various texts in disciplinary contexts,

students can be apprenticed into the conventions of the discipline (Moje 2007, 2008, 2015). Similarly, researchers working within genre theory argue that within any cultural context, such as the science discipline, there will be a broad range of situations that require various genres to meet particular social purposes (Christie 2012; Martin & Rose 2007, 2008). Through the deconstruction of the genres typical of school science, students can be guided into the discipline (Rose & Martin 2012; Schleppegrell 2004).

While researchers within science education, disciplinary literacy and genre theory all agree that students require opportunities to analyse the ways in which meanings are made in disciplinary contexts, there is less agreement on how to engage students. Researchers from representation in science and disciplinary literacy believe that genre pedagogy has a lot to offer, but they are also wary. The emphasis on text deconstruction within genre pedagogy, using systemic functional linguistics, is appealing to those working in science education and disciplinary literacy broadly (Moje 2007; Prain & Tytler 2013). However, Prain and Tytler (2013) warn that a genre approach has 'failed to develop successful pedagogies to support student acquisition of the target competence, other than through explicit teacher instruction' and does not promote student participation (p.10). Similarly, Moje (2015), argues that learning the conventions of a discipline must occur in ways that allows for students to experience disciplinary contexts as dynamic social constructs in which people interact to produce knowledge (Moje 2015).

Genre theorists argue that pedagogy related to genre supports student participation (Rose & Martin 2012), but there are few case studies demonstrating how this can be done. This article presents a detailed case study of how one teacher, working within a biology class in the final year of schooling, was supported to develop teaching strategies from genre pedagogy for engaging students in dialogue about the language conventions of sequential explanations during the deconstruction of text. The specific research question guiding the study was: How can a teacher be supported to use specific teaching strategies from genre pedagogy to engage senior high-school biology students in dialogue about sequential explanations during the deconstruction of text?

Genre pedagogy and classroom dialogue

Researchers working within genre theory argue that student participation in talk about text is central to any pedagogy associated with the teaching and learning of genre. Rose and Martin (2012) present an apprenticeship model for genre pedagogy based on observations of how children learn oral language. They argue that it is through guidance by a more knowledgeable other during social interactions that children are able to develop language orally (Rose & Martin 2012). Rose and Martin (2012) then translate this into a classroom situation and indicate that student learning about genres in disciplinary contexts happens through teacher guidance during dialogue with students.

Rose and Martin (2012) also use Vygotsky's (1962) theory of the zone of proximal development to present a model of pedagogy that involves the teacher

guiding students to understand genres within disciplinary contexts during classroom talk. It is the teacher's role to guide the students from the language knowledge that they have to the language knowledge that is required to create genres independently (Rose & Martin 2012). When working within the zone of proximal development, 'human speech' is used as a 'mediating system' for the 'intentional conveying of experience and thought to others' (Vygotsky 1962, p.6).

The requirement that teachers apprentice students into the language of disciplinary contexts informs the genre teaching and learning cycle. The cycle involves teachers working with students to deconstruct and then jointly construct genres. Deconstruction involves breaking genres down into specific parts to reveal the language patterns essential for achieving a genre's purpose, while joint construction involves the teacher and students writing together (Macnaught et al. 2013; Rose & Martin 2012; Rothery 1995 cited in Dreyfus et al. 2016). Teacher guidance during the first two stages of the cycle enables the final stage in which students independently construct the genre (Rose & Martin 2012; Rothery 1995 cited in Dreyfus et al. 2016).

As students move through the cycle with the teacher, students' understanding of the language required to make specific meanings can be developed (Christie 2012; Rose & Martin 2012). Students learn how language is working within a particular context (Klingelhofer & Schleppegrell 2016; Rose 2011; Rose & Martin 2012) and they develop a way of talking about language (a metalanguage) (Christie 2012; Dreyfus et al. 2016; Macnaught et al. 2013; Rose & Martin 2012).

Previous case studies depicting genre pedagogy

Genre theorists emphasise that the role of the teacher is to guide students towards appropriate language patterns during classroom talk about text. Within this model, the students are in an apprenticeship position, as the teacher, with much more knowledge about the language conventions for the context, supports them to know about and use the language of the discipline. Those working in science education and disciplinary literacy agree with the analogy of an apprenticeship that takes place during classroom talk about representations. Tytler (2007), from the perspective of science education, argues that it is the role of the teacher to scaffold students into the 'very powerful discourses of the scientific culture and scientific ways of viewing and dealing with the world' (p.34). Students require guidance from the teacher as they begin to learn about the conventions of a representation in science and such guidance needs to be within discussions about representations and their conventions (Tytler, Hubber & Prain 2013). Similarly, Moje (2015), working within disciplinary literacy, argues that students must be 'apprenticed into the discourse of the disciplines' (p.258). However, theorists within science education and disciplinary literacy suggest that examples of genre pedagogy highlight explicit instruction by the teacher and there is little evidence of social interaction around text (Moje 2015; Prain & Tytler 2013).

Often case studies of teachers using genre pedagogy have emphasised the role of the teacher to be providing explicitness about language conventions within a specific genre. These kinds of case studies report on the outcomes in terms of the texts students are able to read and produce independently at the end of the

teaching and learning cycle and summaries are provided of the language features that can be explicitly taught as genres are deconstructed and jointly constructed (e.g. Christie 2012; Coffin 2006; Lo & Jeong 2018; Lo, Lin & Cheung 2018; Schleppegrell et al. 2008). However, such studies do not provide detail of how the pedagogical moves of the teacher foster dialogue about language conventions with students. Schleppegrell et al., (2008) report how a history teacher, working within a 7/8 history class, improved student comprehension of texts, as well as essay writing, through explicit teaching about processes, participants, circumstances and reference items. Coffin (2006) reports that explicit teaching of the language associated with text organisation in high-school history can improve student writing of text in history classes. Similarly, Lo and Jeong (2018) demonstrate that the explicit teaching of language for structuring argumentative essays within an Integrated Humanities grade 8 class in English in Hong Kong resulted in improvement in the organisation of expositions. Also in Hong Kong, Lo, Lin and Cheung (2018) report that the explicit teaching of language for naming entities and the activities in which they engage supported year 8 students to produce appropriate scientific explanations in English. While these studies importantly demonstrate that explicit teaching of specific language patterns within disciplinary contexts can improve student reading and writing outcomes, the ways in which teachers involve students in dialogue about language has not been documented.

Christie (1998, 2012) includes some focus on classroom talk. She reports how the teacher's use of direct questioning during instructional discourse, along with students' responses, can be used to construct jointly a genre, but ways to extend

dialogue in these interactions are not a focus. Similarly, Fang and Schleppegrell (2008) suggest that teacher questioning about process types, participants, circumstances, mood, modality, attitudinal vocabulary and language for structure and cohesion will support reading in disciplinary contexts, but strategies for involving students in extended dialogue are not documented.

Two researchers working within genre pedagogy have focused on strategies for engaging students in effective dialogue. Gibbons (1998, 2003, 2018) reports how students with English as an additional language in two mainstream primary classrooms were able to use disciplinary specific ways of making meaning when the teacher recast student responses to highlight more appropriate academic language, used prompts that helped students to reword and expand, and put language of written text into everyday language. Rose (2011, 2017, 2018) draws on studies largely conducted with Indigenous students in Australia to provide a summary of teaching strategies that can involve students in meaningful dialogue about genres. The teacher can maximise student participation by focusing student attention on a particular aspect of a text, preparing the student by pointing out what to look for, and offering evaluations and elaborations in response to student input (Rose 2011, 2017, 2018; Rose & Martin 2012).

Detailed case studies are now required that examine how teachers, working in disciplinary contexts, can use teaching strategies to engage students in meaningful dialogue during particular stages of the genre teaching and learning cycle. This study examines how one senior high-school biology teacher was supported to use strategies over three years to engage students in dialogue

about the language conventions of sequential explanations during text deconstruction.

Methodology

The case study presented here occurred in a linguistically and culturally diverse Australian urban high school. Prior to involvement in this project, the teacher (pseudonym Jane) had not been trained in disciplinary literacy practices. Over three years, she engaged with university-based researchers to learn about genre pedagogy and to apply it within her biology classroom. Design-based research informed the way in which the researchers and teacher collaborated. Design-based studies involve iterative cycles of planning and implementation with teachers. Data collection and analysis occur during each cycle and are used to inform each intervention following the first (Anderson & Shattuck 2012).

Through such cycles of intervention, data collection and analysis, teachers and researchers build practice and theory (Anderson & Shattuck 2012; Barab & Squire 2004; Edelson 2002; Collins et al. 2004). Over three years, the researchers supported Jane to use genre pedagogy when deconstructing texts for a topic on protein synthesis. In each year, Jane chose a lesson to be videoed, which she believed highlighted her use of genre pedagogy to deconstruct text.

Input from the researchers in the first year of the project involved an introduction to the genre teaching and learning cycle. Texts were presented as genres, which have specific grammatical patterns to achieve their purpose within particular cultures and situations. The researchers spoke of how biology is a disciplinary context, in which specific genres, such as sequential explanations,

are valued. The researchers then explained how the language of genres valued in schooling may be far removed from the everyday language of students, which means that students need to be guided by the teacher to learn about the grammatical patterns of specific genres within classroom dialogue. The researchers then introduced the genre teaching and learning cycle to Jane. The version by Rothery (1996 cited in Dreyfus et al. 2016) was used. In this version, students constantly build field knowledge on a topic as they deconstruct a genre, jointly construct a genre with the teacher and finally independently construct the genre. The researchers then explained that the project would focus on engaging students in dialogue about the language of sequential explanations during the stage of text deconstruction. Deconstruction of texts, including written verbal and visual representations of information, was introduced to Jane as part of genre pedagogy, but the researchers did not provide explicit support on how to do this. Jane was invited to present her version of text deconstruction in the first year of the project.

Analysis of the video data that captured Jane's practice in the first year, as well as research by Gibbons (1998, 2003, 2008, 2018) and Rose (2011, 2017, 2018), then informed the practices that were explicitly shared with the teacher and trialled in the second and third year of the project. The practices used from Rose's (2011, 2017, 2018) work included the teacher focusing student attention on part of a reading task, preparing the students by pointing out what to look for, and then offering forms of evaluation and elaboration in response to student input. Gibbons' (1998, 2003, 2008, 2018) work then provided specific forms of preparation and elaboration that the teacher could use. Preparation could

include the teacher converting part of the text into everyday language (Gibbons 1998, 2003, 2008, 2018). Teacher elaborations that support students to deconstruct text include recasting student responses into more appropriate academic forms and using prompts to help students to reword/expand on their responses (Gibbons 1998, 2003, 2008, 2018).

At the end of the first year of the project, the researchers shared with Jane analysis of video data from her classroom and introduced the specific teaching practices of focusing, preparing, converting to everyday language, evaluating and elaborating. Discussion of ways in which the teacher could elaborate on student responses included the practices of recasting and prompting. The researchers pointed out how these practices could have been used to initiate and extend dialogue in the first lesson and explained how these strategies could be used to a greater extent when deconstructing images and written verbal texts to generate dialogue about the language patterns that are appropriate for sequential explanations on protein synthesis. The researchers also raised the possibility of deconstructing more extended verbal written text in the class to generate dialogue about language. The teacher identified for the researchers extracts of verbal written texts from the textbook that could be useful for the teaching of the topic.

The analyses provided by the researchers identified the text extracts selected by Jane as sequential explanations. The researchers explained that such texts are written as a temporal sequence of activities, with each clause usually containing a precise material process that explains the activity in which a participant is

engaged (eg detaches) (Halliday 1993; Hao 2015; Martin 1993a,b). It was pointed out that noun groups are used to present precise and succinct information about the types of participants (eg RNA polymerase) (Hao 2015; Martin 1993b), components of participants (eg the end of the gene) (Hao 2015; Martin 1993b) and information about what the participants look like (eg *single stranded* pre-mRNA) (Hao 2015). The researchers also explained that the clauses that provide the sequence of activity are also usually packed with circumstances, in the form of prepositional phrases, to provide information about where activities are happening (eg from the ribosome) (Halliday 1993; Hao 2015) and nominalisation is also used to name and identify a pattern of activities (eg transcription) (Halliday 1993; Hao 2015; Martin 1993c).

The researchers also pointed out how these sequential explanations will often contain clauses that are designed to define and to give attributes to participants (Halliday 1993; Hao 2015; Martin 1993a, b, c). The creation of definitions through the use of a relational process was modelled (eg Transcription is the process by which DNA is copied in the form of mRNA). The researchers also demonstrated how relational processes could be used in the clause to give attributes to participants (eg the tRNA has an anticodon).

The analyses undertaken by the researchers were given to Jane in the form of powerpoints. On the slide was a short extract from the textbook. In the notes section was the analysis provided by the researchers. Jane was encouraged in the second and third years of the project to use some of this analysis as she

deconstructed text with her students and tried to extend classroom dialogue about language.

The work of Rose (2011, 2017, 2018) and Gibbons (1998, 2003, 2008, 2018), along with analyses of the video data for the three lessons informed the practices that were trialled with the teacher. The unit of analysis used was learning cycles that occur within the lesson activity of text deconstruction. A learning cycle within text deconstruction can include the teacher focusing on part of a text, preparing students for what to look for, elaborating on a student response and evaluating a student response (Rose, 2017, 2018). The student's task within this kind of learning cycle is to respond to the focus, preparation and elaboration provided by the teacher (Rose, 2017, 2018).

Each of the learning cycles that occurred was first analysed by looking at the specific teaching strategies that the teacher used during text deconstruction.

Questions guiding analysis included:

- Does the teacher focus student attention on a particular part of the text?
- Does the teacher prepare the students by pointing out what to look for?
During preparation, does the teacher convert parts of the text into everyday language?
- Does the teacher provide some evaluation of student responses?
- Does the teacher elaborate on the student input? During elaboration, does the teacher recast student responses into more appropriate academic forms and use prompts to help students to reword/expand on their responses?

The analysis then moved from looking at the teaching strategies of the teacher to the extent and form of participation by the students. This involved looking at how many students participated, as well as whether their engagement involved:

- Asking clarifying questions;
- Offering information;
- Responding to teacher evaluation;
- Responding to teacher elaboration.

In the next section, the results from the video data analysis are presented. The first videoed lesson occurred in 2017, the second in 2018 and the third in 2019. Learning cycles that are representative of the kind of dialogue that occurred in each of the three lessons have been selected. A pseudonym was applied to the teacher at the time of data analysis and student names were removed from the transcripts.

Results

Lesson 1

Jane begins her 2017 lesson by writing a list of ten key terms on the whiteboard. She then hands out a sheet to each student containing three diagrams that are temporally sequenced and do not contain annotations. Jane then writes the instruction on the board for the students to 'clearly label the diagram to explain the process of transcription'. The students then work individually to do this.

During this introduction to the lesson, Jane does not focus the students' attention on a particular part of the provided visual text. The list of terms provided on the white board is an attempt to prepare the students for what to look for in the text, but, without the teacher making more connection between terms and specific parts of the visual representation, many of the students are lost. Only some of the students in the class are able to write a lot on the provided visual text.

Jane then displays the visual text that the students have on the whiteboard. She asks the students 'Who thinks they've finished'. One student indicates that they have. Jane invites the student to come and write on the images displayed on the whiteboard but the student declines. She then asks the student to share what he has verbally. The following dialogue between Jane, this student and 2 other students sitting next to him then takes place. As the students offer responses, Jane writes a sequential explanation next to the visual representations on the whiteboard.

Learning cycle	Contributor	Dialogue	Form of teaching strategy and student response
1	Teacher	All right, tell me what you've got on the first one, [student name]	Focus on first of 3 diagrams

1	S1	The RNA polymerase attaches to the gene.	Offering information
2	Teacher	All right, who's got a; I know you're still going but let's add to it and see if we can make a really good one. Who's got something for this one that they're willing to share? What about [student name]? You? Do you want to write it or tell me it?	Focus on middle diagram
2	S2	The RNA polymerase unwinds the DNA and moves along a template strand creating a complementary mRNA strand.	Offering information
3	Teacher	What about umm, what about the last one. The last one is easy. [student name] what have you got for the last one.	Focus on last diagram
3	S3	Ahh the stop codon thing happens and it disconnects.	Offering information
4	Teacher	All right, does anyone want to add anything to any of these? Anybody? In front of a? Is	Focus back to first diagram and focus on the promoter

		everyone happy with the first one? Does anyone want to add anything extra? Is there anything we could add to it – to the promoter?	
4	S1	Add the 3 - 5 end	Offering information
5	Teacher	What is the promoter for? The promoter for what? Is it a promoter for at work where you get promoted?	Focus and preparation with conversion to everyday language
5	S1	For the RNA	Responding to teacher elaboration
5	Teacher	So is it a gene that is being umm transcribed? Is it a promoter for the genes?	Elaboration with recasting
5	S1	Yes	Response to teacher elaboration

Table 1: Whole-class dialogue occurring during lesson 1

One student dominates the dialogue that occurs. The focusing done by the teacher is often not specific and usually refers only to the first, middle or last

diagram. Jane does not focus students' attention to specific parts of the three visual images. Jane does not point to a term listed on the whiteboard and connect it with a specific part of a diagram as a way to focus and prepare more students to participate. As a result, the visual diagrams provided are not deconstructed. Only once does Jane deconstruct the technical terms written on the whiteboard. She focuses on the technical noun 'the promoter' and converts this to everyday language. Otherwise, there is little use of preparation by the teacher. There is also little elaboration on student responses. Often the teacher begins a new learning cycle, by focusing on another diagram, rather than elaborating on a student response. An exception to this is in learning cycle five where the teacher uses a student response to recast to an appropriate academic verb 'transcribed'.

Lesson 2

Analysis of Jane's video data from the first year informed the nature of the intervention that occurred for the second year. The researchers shared with Jane the specific teaching practices of focusing, preparing, converting to everyday language, evaluating and elaborating. The researchers also 'analysed' Jane's selected extracts from the textbook to provide guidance about the language features that could be highlighted during text deconstruction.

Jane begins a lesson in 2018 by drawing a diagram on the whiteboard. She then begins to deconstruct the visual image by pointing out specific sections to the students and asking questions about that particular part.

Learning cycle	Contributor	Dialogue	Form of teaching strategy and student response
1	Teacher	What role does the nucleus play in producing the protein?	Focus on first part of diagram which is a nucleus and prepare
1	S1, S2, S3, S4 together	It's got the code	Offering information
1	Teacher	OK so this has got the instructions	Elaboration with recasting
2	Teacher	And what are these red things?	Focus on second part of diagram which is the ribosomes and prepare
2	S1, S2, S3, S4, S5 together	Ribosomes	Offering information
2	Teacher	And what do they do?	Elaboration with prompt to expand
2	S1	They arrange certain things	Responding to teacher elaboration
2	S2	They make the amino acids	Responding to teacher elaboration

2	Teacher	They make the amino acids?	Elaboration with prompt to reword
2	S1	They arrange the amino acids	Responding to teacher elaboration
2	S2	They arrange the amino acids	Responding to teacher elaboration
2	Teacher	Into?	Elaboration with prompt to expand
2	S1	A protein	Responding to teacher elaboration
2	S6	A coding process	Responding to teacher elaboration
2	Teacher	Do they just arrange them and?	Elaboration with prompt to expand
2	Multiple students together (inaudible)		Responding to teacher elaboration
2	S5	They carry them	Responding to teacher elaboration
3	Teacher	Ok and then what is this messy thing that I have drawn here?	Focus on next part of the diagram which is endoplasmic reticulum and prepare

3	S5	Endoplasmic reticulum	Offering information
3	Teacher	So what does it do?	Elaboration with prompt to expand
3	S5	It puts the (inaudible) the protein	Responding to teacher elaboration
3	S7	It modifies the protein	Responding to teacher elaboration

Table 2: Whole-class dialogue occurring during the first part of lesson 2

By focusing on individual parts of the diagram and using specific questions that prepare students for what to look for, Jane gains much more student participation than in 2017. Through the strategies of focusing and preparing Jane encourages the students to use the key language patterns for sequential explanations. Jane's first question, '[w]hat role does the nucleus play in producing the protein?' prepares the students to look for the role of the nucleus and also encourages the students to use the attributive clause structure with a relational process: 'It's got the code'. The use of focus and preparation also guides the students to use academic technical noun groups to name key entities. For example, in response to Jane's question 'what is this messy thing that I have drawn here?', a student replies 'endoplasmic reticulum'. In this response, the student uses the correct academic technical term, which includes classification within the noun group.

Because more students participate initially, there are also more students involved in responding to the teacher’s elaborations. Jane uses much more elaboration, with prompts for expansion and rewording, which extends the learning cycles and includes greater student participation. For example, once she has asked the students to identify the ribosomes in a text, she asks them to elaborate through expansion by identifying the material processes the ribosomes are involved in. One student uses the appropriate material process ‘arrange’, while another uses the inappropriate material process ‘make’. Jane then uses a prompt to ask the student with the inappropriate material process to reword and the student is then able to use the more appropriate material process ‘arrange’. Jane then provides another prompt asking the students to expand by giving the object of the material process and a student responds with ‘[a] protein’. Jane then asks the student to expand again by prompting them to use an additional material process to describe the actions of the ribosomes. Multiple students participate and the material process of ‘carry’ is established.

Jane then continues her lesson. She displays some written verbal text from the textbook on the whiteboard and begins to deconstruct it with the students.

Learning cycle	Contributor	Dialogue	Form of teaching strategy and student response
1	Teacher	This is just taken from our books and we are	Focus on verbal written extract

		going to see if we can work out what it means.	
1	Teacher	[Teacher reads out the text book extract that is displayed on the white board and underlines the noun group 'mobile copy'.]	Focus on noun group
1	S1	Mobile means a copy of the gene that can be released.	Offering information
1	Teacher	OK yep. So it can leave the nucleus.	Elaboration with recasting
2	Teacher	Who can tell me what this means, when the gene becomes active?	Focus on clause 'when the gene becomes active' and prepare
2	S1	So when a gene needs to be used	Offering information
2	Teacher	What does it mean when a gene needs to be used?	Elaboration with prompt to reword
2	S1	When a gene that needs to be used to create	Response to teacher elaboration

		spider silk it isn't going to [inaudible]	
2	Teacher	Ok so what is it producing?	Elaboration with prompt to expand
2	S1	The thing	Response to teacher elaboration
2	Teacher	So what is the thing?	Elaboration with prompt to reword
2	S7 and multiple students together	The protein	Response to teacher elaboration
2	Teacher	So this means if a gene is active it is making a protein.	Elaboration with prompt to expand Teacher writes 'making the protein' on the whiteboard by the text 'When a gene becomes active'
2	Teacher	So sometimes it is called being expressed. So being expressed that is another word. We will go through this again.	Elaboration with recasting Teacher writes verb group 'being expressed' on to the

			whiteboard alongside the text about a gene being active
3	Teacher	So when a gene is switched on. So when a gene is switched on are you right [student name]?	Focus back to part of text and preparation with conversion to everyday language Teacher writes verb and preposition 'switched on' above the words 'becomes active' in the text extract
3	Teacher	So all your genes are doing things at the moment. We talked about this the other day. There are genes that code for hair. They only work in your skin cells. And only certain skin cells. They are only active in certain skin cells.	Preparation with conversion to everyday language

4	Teacher	[Teacher reads through the displayed text extract again.]	Focus on verbal written text
4	Teacher	So if you had to write transcription in your own words what is it? Transcription is the...	Prepare
4	S9	Process of making a protein	Offering information
4	S2	Replication of DNA	Offering information
4	Teacher	Ok a replication or making a	Elaboration with prompt to expand
4	S9	Process of making a certain protein I guess you could say	Response to elaboration
4	Teacher	You can say replicate if you like	Elaboration with recasting
4	S1	Is 50% of RNA the original DNA?	Asking clarifying question
4	Teacher	No	Evaluation
4	S1	So it's fully copied?	Asking clarifying question
4	Teacher	Yeah, it's a copy.	Evaluation

4	S1	Okay. So does that mean it has to split twice?	Asking clarifying question
4	Teacher	No, we'll go through the process. So transcription, what did we say? How can we describe transcription? Transcription is the process of? Making a?	Evaluation Elaboration with prompt to expand
4	Multiple students together	copy	Offering information
4	Teacher	A copy of	Elaboration with prompt to expand
4	Multiple students together	DNA of DNA	Response to elaboration
4	Teacher	Making a copy of the DNA code	Elaboration with prompt to reword and expand- Teacher writes 'Transcription is the process of making a copy of the DNA code found in the nucleus.'

5	Teacher	So does anybody know what does transcribe mean if you transcribe something?	Focus on nominalisation 'transcription' and prepare with conversion to everyday language
5	S10	You write something	Offering information
5	Teacher	So you write something out – writing out a copy of the code. So you are transcribing the DNA.	Elaboration with recasting

Table 3: Whole-class dialogue occurring during lesson 2

Jane focuses on specific parts of the text and prepares the students by pointing out what to look for through converting to everyday language. For example, Jane selects an attributive clause from a textbook extract, 'when the gene becomes active', and converts this into the everyday language of '[s]o when a gene is switched on'. Later in the lesson, Jane focuses the students' attention on the nominalised term 'transcription' and then converts it to the more everyday verb 'to transcribe'. A student was then able to join the dialogue and provide the alternative material process of to 'write'. Her elaborations include prompts to support students to reword and expand. For example, Jane invites the students to elaborate on what genes produce. Multiple students enter the dialogue to

provide the appropriate response that genes produce protein. On another occasion, Jane elaborates on students' responses and provides a prompt for them to expand by asking the students what kind of copy is produced during the process of transcription. Multiple students are able to participate and indicate that it is a copy of DNA. Recasting to more academic language also occurred. For example, Jane recasts a student's use of a material process from 'making' to 'replicate'.

Lesson 3

The intervention that occurred prior to year three drew on video analysis from the second year and encouraged Jane to further develop the strategies that she had introduced. Within the third lesson, Jane constantly uses the strategies of focus, preparation and elaboration as she deconstructs both written verbal and visual texts. As in the second lesson, student participation is enhanced as a result. One learning sequence from early in the lesson occurs when Jane displays an extract from the textbook and breaks it into parts.

Learning cycle	Contributor	Dialogue	Form of teaching strategy and student response
1	Teacher	So, what the role of this RNA is to carry the copy of	Focus on diagram of the cell and prepare with

		<p>the genetic construction from the nucleus to the cytoplasm so it's known as messenger RNA.</p> <p>[Teacher draws diagram of cell on the whiteboard].</p> <p>So, if this is our cell, here is your DNA, so the copy can go outside the nucleus. So it's called messenger RNA. We talked about that messenger RNA yesterday, do you remember this?</p> <p>Yep. What's the role of messenger RNA again?</p>	<p>conversion to everyday language</p>
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1	Multiple students together	Transport a copy, copy, carries a copy	Response to teacher elaboration
1	Teacher	It carries a copy of the?	Elaboration with prompt to expand
1	Multiple students together	Genetic code	Response to teacher elaboration

Table 4: Whole-class dialogue occurring during lesson 3

Within this third lesson, Jane effectively uses the teaching strategies that she developed in the second year. She focuses on part of a text and prepares the students by converting the classifying noun group 'messenger RNA' to the everyday language of a copy of the genetic material going 'outside the nucleus'. Jane then asks the class 'What's the role of messenger RNA again?' and multiple students are able to respond with various appropriate material processes: '[t]ransport a copy', 'copy', 'carries a copy'. Jane also uses elaboration with a prompt to expand and multiple students are able to use a classifying noun group to state that the messenger RNA carries a copy of the 'genetic code'.

Discussion

The case study presented here sought to bring together one part of the teaching and learning cycle, text deconstruction, with strategies from genre pedagogy for

illiciting and expanding student participation in classroom dialogue. Over three years, Jane successfully developed a pedagogy for involving students in classroom dialogue about language when deconstructing visual and written texts. Jane's work within a senior high school biology classroom demonstrates that the teaching strategies from genre pedagogy of focusing, preparing and elaborating can be used during text deconstruction to increase the number of students participating in classroom dialogue about disciplinary specific language and to extend the dialogue occurring.

During the second and third years of the project, Jane effectively used teaching strategies that apprenticed students into the ways of making meaning in the disciplinary context. Researchers from genre theory, representation in science and disciplinary literacy all agree that an apprenticeship is required (Tytler 2007; Moje 2008, 2015; Shanahan & Shanahan 2008; Rose & Martin, 2012) but the methods for providing this apprenticeship have been contested (Moje, 2015; Prain & Tytler, 2013). The case study presented here demonstrates that genre pedagogy can be used to develop social interaction around text in the classroom. The strategies used by Jane enabled her to work in ways consistent with Vygotsky's (1962) theories of learning. Through generating active student participation, she was able to work with the students' current levels of knowledge about language and establish classroom dialogue that involved spoken language being used as a mediating tool for learning in a disciplinary context.

The teaching strategies from genre pedagogy that worked effectively for Jane involved focusing, preparing and elaborating. In the second and third years of the project Jane focused students' attention on particular parts of the texts and prepared the students to interpret these parts in specific ways. Through the strategy of preparation, Jane also converted elements of texts to more everyday language. Jane also elaborated on student responses, which extended the learning cycles. Recasting to more disciplinary specific language occurred, as did prompting to support the students to reword and expand. More students participated in the lessons during the second and third years of the project. This meant that more students experienced processes of elaboration, which supported their use of language relevant for the disciplinary context.

Through her evolving pedagogy, Jane effectively initiated and sustained classroom dialogue about appropriate language for sequential explanations in biology. The classroom talk involved attributive clause structures, academic technical noun groups to name key entities, classification within the noun group, nominalisation and material processes. Jane found it difficult to generate classroom dialogue about circumstances. At times, Jane included circumstances of place within her dialogue (e.g. 'in the nucleus' and 'from the nucleus to the cytoplasm'), but Jane could have used more prompting to support the students to expand their use of circumstances. The findings suggest that circumstances may be more difficult than other grammatical elements to build into classroom dialogue.

Conclusions can also be made from this case study about the nature of the intervention provided by the researchers. The introduction to the parts of the genre teaching and learning cycle in the first year of the project was not sufficient to illicit and extend student involvement in dialogue during text deconstruction. Jane required more knowledge about language to be able to focus effectively on specific parts of texts, and she also needed knowledge of specific ways to invite and extend student participation in classroom dialogue. Providing Jane with knowledge about language in the disciplinary context through analysis of relevant textbook extracts proved to be extremely effective. The analysis provided by the researchers was immediately relevant for Jane's teaching context. Analysis of video data, along with the sharing of teaching practices from the work of Rose (2011, 2017, 2018) and Gibbons (1998, 2003, 2008, 2018) provided Jane with specific and manageable strategies that could be effectively applied in the classroom. The results indicate that support for knowledge about language and specific teaching practices are both required to enable teachers to create classroom dialogue about language in disciplinary contexts.

Generating dialogue about language is essential for students to develop a way of talking about why specific language patterns are appropriate for particular disciplinary contexts. Through these discussions they can acquire a metalanguage (Christie 2012; Dreyfus et al. 2016; Gibbons 2018; Macnaught et al. 2013; Rose & Martin 2012) and transfer their learning of language beyond the immediate topic being studied (Dreyfus et al. 2016). At times, Jane could have elaborated further on the classroom talk about language to support the

development of a metalanguage. For example, after recasting to a more appropriate material process to describe the action of the ribosomes, Jane could have named the words 'arrange' and 'carry' as material processes and explained how in biology it is extremely important to choose the right process to explain the action of a participant. Elaborating in this way would have helped the students to take the learning about language beyond the immediate topic of protein synthesis.

Strategies from genre pedagogy can be used during text deconstruction to illicit and extend student participation in classroom talk about disciplinary specific language. Interventions that aim to develop teaching practices for engaging students in dialogue during text deconstruction and support teachers to develop knowledge about language for specific contexts can effectively transform pedagogy so that students are apprenticed into disciplinary ways of making meaning. More case studies are now required to reveal how the pedagogy presented here can be used to enhance classroom dialogue about texts in other disciplinary contexts.

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