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Citation for the original published paper (version of record):

Negretti, R., McGrath, L. (2020). English for Specific Playfulness? How doctoral students in Science, Technology, Engineering and Mathematics manipulate genre. *English for Specific Purposes*, 60(October): 26-39.
<http://dx.doi.org/10.1016/j.esp.2020.04.004>

N.B. When citing this work, cite the original published paper.

English for Specific Playfulness? How doctoral students in Science, Technology, Engineering and Mathematics manipulate genre

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This is a pre-copyedited, post-print, author-produced version of an article accepted for publication in *English for Specific Purposes* following peer review. The version of record can be accessed through the link below.

English for Specific Purposes, Volume: 60 October 2020, page(s): 26-39
The publisher version can be found at:
<https://doi.org/10.1016/j.esp.2020.04.004>



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Abstract

Genre analysis is a powerful pedagogy to foster doctoral students' awareness of academic writing conventions and variation. Nonetheless, concerns remain about the risks of promoting rhetorical 'painting by numbers', with writers glumly surrendering agency and authorial voice. Recent reappraisals of genre pedagogy encourage fostering genre manipulation, innovation, and play. We examine whether genre pedagogy can indeed promote conscious manipulation and even playfulness of academic genres, or at least an enhanced sense of control over conventions. Data from interviews with 30 doctoral students in Science, Technology, Engineering and Mathematics (STEM) collected over a two-year period were analyzed to extract comments pertaining to deliberate authorial choices, unconventionalities in writing or writing processes, and positive shifts in writing perceptions. The findings reveal students' appreciation of genre awareness and a sense of control from knowledge of genre conventions, affording them agency in their writing. Crucially, students do not appear to surrender to standardization but are instead agentive and metacognitive in their approach to writing, using their genre knowledge to compose, manipulate, and critique their genres.

Keywords: genre pedagogy, genre knowledge, genre manipulation, academic writing, writing for research, metacognition, creativity

1. Introduction

“I will not mix genres.

I repeat: genres are not to be mixed. I will not mix them”

Derrida (1980, Transl. by Ronell)

Derrida’s (1980) words encapsulate the “enigma of genre” (p.56): limit, interdiction, norm, law; but also practice, event, a concept that foreshadows what is likely to transpire. The core of this duality is “the law of impurity” of genres (Derrida, 1980, p. 57): they are both created and constantly contaminated by their recitation, their repetition, and the sum of their (situated) anomalies. The scholarship around genre analysis and genre pedagogy has long recognized the inherent contradictory nature of genres. Genre-based pedagogical approaches to academic writing have foregrounded both conventions and situational variation, and while analysis of typical generic features is foundational, the fostering of rhetorical consciousness, rhetorical flexibility, and the ability to manipulate genres through deliberate authorial choices is also strongly advocated (Cheng, 2018; Johns, 2002; Tardy, 2016; Swales, 1990).

The “law of impurity” (Derrida, 1980 p. 57) also exposes the risks inherent in an educational approach that scaffolds the recognition of conventional forms of genre production, namely focusing on what is typical while neglecting the deceptive nature of this typicality, or in the words of Swales (2017, p. 251), promoting “stultifying standardization” in academic writing. The risk of standardization occurs when students are not led to see that genres are tools to get something done, and as such are adaptable in response to each communicative situation (Miller, 1984). As Tardy (2016, p. 129) emphasizes, “the question is not whether genres should be taught, but rather how instruction can best facilitate learners’ ability to use genres effectively”. To this end, Tardy underscores the necessity to help students develop an understanding of genres’ innovation potential: the fact that when skillfully and *intentionally* manipulated, they can help writers achieve rhetorical goals, including “alternative ways of understanding an issue or constructing knowledge; expressing oneself in unique ways; engaging readers; and resisting, changing and critiquing dominant discourses” (Tardy, 2016, p. 131). Ultimately, this is a perplexing dilemma for teachers of academic/research writing and a significant challenge for our doctoral writers: can doctoral writers engage critically with genre conventions, using their genre knowledge to establish legitimacy through their own authorial choices, and still meet genre expectations? Can students express their creativity and engagement in writing, despite the potential risks inherent in genre manipulation? Are our students willing and able to adapt “the genre recipe” to their taste?

In this paper, we explore what doctoral students in Science, Technology, Engineering and Mathematics (STEM) do with their genre knowledge in the months following a genre-based course in writing for research. STEM students constitute an interesting group, as writers in science and engineering have been called a “forgotten tribe” (Emerson, 2017), and their writing practices considered relatively standardized and rigid when compared to those in the social science and humanities (see also Tardy, 2016). For these students, the development of genre knowledge may occur prevalently via socialization, rather than via writing instruction, and as a result their understanding of scientific genres may remain relatively implicit. Therefore, it is both intriguing and important to explore what PhD students in STEM do with their knowledge of genre conventions after being exposed to a genre pedagogy course, and to obtain empirical evidence that genre-based pedagogy promotes a conscious, intentional, and potentially agentic use of genres. Our aim is to investigate whether our participants glumly surrender to the dictates of the genre “law”, or instead seem aware and take advantage of the impure nature of genres (Derrida, 1980). Do they, manipulate, adapt, or even play with genre conventions when they write?

2. Literature review and theory

Before returning to genre pedagogy, we will briefly discuss learning to write in the sciences, to highlight the unique challenges shared by the participants of this study.

2.1 Learning to write in STEM: cognitive apprenticeship and its limits

Scientific writing—the dissemination of research—often requires knowledge of many different genres and the rhetorical flexibility to adapt those genres across audiences beyond academia, such as industry, governmental bodies, and the wider public (Emerson, 2017). At the graduate and post-graduate level, the development of these advanced scientific writing skills happens primarily through a process of implicit socialization (Wickman & Östman, 2002). We call this process implicit as typically it does not occur through overt pedagogical intent, but rather via expert guidance in a supportive learning context. In other words, students learn to think and communicate in disciplinary relevant ways primarily through experiences of cognitive apprenticeship (Bazerman, 1988; Emerson, 2017; Wickman & Östman, 2002; Yore, Hand & Prain, 2002). The term “cognitive apprenticeship” (Collins, Brown & Holum, 1991) was originally conceptualized as a pedagogical approach in which individuals develop cognitive and metacognitive strategies—methods for thinking and problem solving—through meaningful interaction and guided experiences with skilled others. In the sociocultural tradition of writing research, cognitive apprenticeship has instead come to signify the kind of dialogic and naturalistic processes of disciplinary enculturation that are fundamental to becoming an expert writer (Bazerman, 2004; Prior, 1998), especially in STEM (Florence & Yore, 2004).

For many doctoral students, irrespective of discipline, apprenticeship is the sole route to developing their writing expertise. Apprenticeship-based learning experiences are contingent on whether the immediate writing context provides socialization opportunities – a community of writers and a dialogue around scientific writing practices (Dysthe, 2002; Emerson, 2017). In these contexts, expectations governing disciplinary communication often remain tacit, and are acquired through practice, mediated by disciplinary genres (Berkenkotter & Huckin, 1995). This informal cognitive apprenticeship route could be loosely compared to a badly controlled experiment. If it works, it is a critical catalyst for the development of future scientists, but the alternative is uncertainty and agony (Aitchinson, Catterall, Ross & Burgin, 2012).

The success of cognitive apprenticeship as a pathway to writing expertise is riddled with hurdles. Firstly, learning via socialization is vulnerable to the influence of perceptions about gender and race (Falconer, 2019) and geopolitical and situational variables (see McMullan, 2018). On an emotional level, doctoral students have been shown to experience anxiety as they develop their writing expertise (Russell-Pinson & Harris, 2019). On a cognitive level, doctoral students struggle to self-regulate their writing, facing the challenge of reconceptualizing the text as an artifact in progress—rather than a product—as well as themselves as writers (e.g. Castelló, Inesta & Corcelles, 2013; Clark, 2016; Ivanič, 1998). In practice, doctoral students have difficulty determining the kind of discursive and rhetorical choices they need to make in order to establish legitimacy in the eyes of their readers—especially when these readers come from varying disciplinary backgrounds (as is often the case in STEM writing).

Thus, learning to be a scientific writer is a rather hit-and-miss affair. Learning by apprenticeship is dependent on situational conditions, is time-consuming, painstaking and, essentially, not a pedagogy. The current STEM context appears to offer limited, largely unarticulated and unsystematic support for emerging scientists as writers, with none of the learning pathways currently available “designed to help learners to acquire the kind of

knowledge about language that might enable them to be aware of what they might achieve by choosing to write in different ways” (Burton & Morgan, 2000, p. 450). Without explicit access to the genre knowledge and cognitive and metacognitive strategies of expert writers, students must learn intuitively how to modulate their authorial choices.

2.2 Genre pedagogy in scientific writing: conventions, manipulation, and agency

Clearly, “an approach that ... allows [students] to see how texts are constructed, and why” (Emerson, 2017 p. 27) is needed. Genre pedagogy can to some extent respond to this need. Cheng (2018) poses two inter-related instructional objectives for genre pedagogy. First, genre pedagogy should aim to instill discipline-specific genre knowledge and “constantly update” (Cheng, 2018, p.46) knowledge of genre conventions and variation. Second, genre pedagogy should equip students with a conceptual framework that they can use across writing contexts. In other words, this means raising students’ metacognitive awareness of genre analysis as a reading/writing heuristic (Negretti & McGrath, 2018). If we agree that these are the aims of genre pedagogy, we need more evidence that the approach actually delivers and is effective in the longer term (i.e. after a course has finished). In other words, we need evidence of how students across disciplines *intentionally* use genre knowledge/awareness in authentic writing contexts, what we will refer to as genre manipulation.

Here, genre manipulation pertains to the metacognitive¹, conscious and agentic adaptation of genre conventions as tools to achieve desired outcomes. This goal-directed and self-regulated characterization distinguishes genre manipulation from genre application, which can be seen as a more ‘painting by numbers’ response to genre convention. Arguing for the promotion of genre innovation among students, Tardy (2016) implies that it requires both *conscious* and *intentional* manipulation of genres, with students taking deliberate advantage of genres’ inherent variation, and quotes Hyland (2012, p.146): “the (rhetorical) options available to them and the effects of manipulating these options for interactional purposes”. We note that the study of genre innovation requires an assessment of reception (how the readers react to writers’ manipulation efforts); our gaze remains on the writer in that we seek evidence of genre manipulation — the conscious (metacognitive), intentional (self-regulated) and agentic adaptation of genre conventions as tools to achieve desired outcomes.

Previous ESP genre studies on STEM have focused on the identification of textual patterns and typical rhetorical moves to characterize disciplinary genre conventions (e.g. Bruce, 2009; Graves, Moghaddasi & Hashim, 2014; Kanoksilapatham, 2005; Peacock, 2002; Stoller & Robinson, 2013). While enlightening from an applied linguistic perspective, these studies of textual convention often sideline the voice of authors themselves and thus provide limited insights into writers’ processes and experiences of manipulating scientific genres, be they students or established scholars. Some exceptions include, among others, Curry (2014), Dressen-Hammouda (2014), (Author) (2016), Shaw (1991), Wickman (2010).

Notwithstanding its usefulness, the analysis of typical genre features risks crystallizing the notion of disciplinary discourse as monolithic, pushing students to glumly surrender to convention rather than fostering agency, risk-taking (see Muir, 2018), and creativity (Thurlow, Morton & Choi, 2017). Indeed, a common critique of genre pedagogy (see e.g. Hyland, 2007) is that a focus on textual convention promotes conformity and stifles writers’ creativity. By way of response, in a recent essay titled *Standardisation and its discontents*, Swales (2017) articulates the importance of encouraging experimentation. Similarly, Tardy (2016, p. 271) underscores that “genre innovation is part of expert genre knowledge”, since genre scholars clearly concur that experts exploit, manipulate, and innovate their genres

¹ For an overview of metacognition and its role in learning, see Winne and Azevedo (2014).

(Miller, 1984). The fact that expert writers are often creative and deliberate in their approach to genre is also apparent in STEM: in Emerson's (2017) study of scientists, some of the most successful writers communicated to a broad audience and across disciplines, and tended to perceive good scientific writing as creative, enjoyable, and innovative. Echoing Derrida's law of impurity, Tardy (2016, p. 176,) observes: "Without the potential to bend, flout, disrupt, resist, parody, critique and transform the genres that regulate communication, they become static and insufficient tools for human communication".

In this study, we investigate whether students surrender to conventions, or if they use their genre knowledge to manipulate, and perhaps even play with those conventions. We posit that from a theoretical perspective, this question invokes the concept of agency, and can in fact be framed as follows: does genre pedagogy promote agency in scientific writing? Specifically, we argue that the *intentionality* implied by the concerns about genre innovation, manipulation and creativity in the literature reviewed above, all fall under the conceptual umbrella of agency. Agency is a concept applied in different fields with different meanings. In writing studies, agency has been tied to writers' ability to see and exploit socially available possibilities for creating an identity through their texts (Ivanič, 1998). Similarly, the conceptualization of agency from social cognitive theory (Bandura, 2000), emphasizes the reciprocal influence of personal factors (cognition, motivation, self-belief) and environmental conditions in the exercise of human action. This conceptualization underscores that when people lack the skills to engage in reflective, self-regulated practice, they will likely feel disempowered. Conversely, agency is fostered when people acquire awareness of how to set goals, make proactive plans, guide their own practice, and evaluate their efforts (Bandura, 2000). It is clear that unless doctoral students have received explicit guidance in scientific writing, these determinants of agency may be very much out of their reach. In the development of scientific writing expertise, we could therefore describe agency as the perceived ability to manipulate an array of linguistic and rhetorical skills: instead of being subject to conventions, students perceive themselves as the subject that takes action, i.e. the agent (Ivanič, 1998). In sum, we focus on the sense of agency as manifested in their manipulation of genre.

2.3 Summary and research questions

To reiterate, there is value in investigating whether students of scientific writing exposed to genre pedagogy surrender to convention or take an agentic approach to their writing. Our research questions are:

- 1) How do students use their genre knowledge to intentionally manipulate, and even play with genre conventions?
- 2) What sense of agency is manifested in manipulating research genres—if at all?

Our findings, while perhaps not offering thrilling instances of genre play and convention-breaking, do provide intriguing insights into our participants' authorial choices, dilemmas, and experiences in their efforts to take control of research writing.

3. Method

3.1 Setting and participants

This study is part of a larger project conducted at a technical university in Scandinavia. Participants were 30 doctoral students in STEM (see Table 1), recruited from 6 consecutive runs of an 8-week course on writing research articles (RA) over two years. The course aims to foster students' proficiency in writing RAs and their ability to make discipline-specific and strategic writing choices. Typically, students are required to have already written an RA prior

to taking the course. The course comprises genre analysis tasks (Swales & Feak, 2012) and tasks designed to scaffold metacognitive awareness of genre and their own writing practices (Negretti & McGrath, 2018). First, students are introduced to concepts such as genre, discourse community, rhetorical purpose and moves. Subsequent sessions focus on specific sections of the RA. Students analyze self-selected articles, and compare and discuss differences and similarities within and across disciplines. The first assignment asks students to describe their writing context, thereby fostering reflection on socio-rhetorical aspects of scientific writing such as audience(s), genre expectations, and their own position in this context as writers. Then, each week students are required to write a short assignment corresponding to a section of an ongoing RA, give feedback to two of their peers, revise their own text based on feedback, and submit this revised text with a short reflection on the changes made. The final assignment asks the students to summarize and reflect on what they learned about the RA genre in their specific field.

The participants in the present study operate in a variety of fields (see Table 1). They were at different stages of their PhD career, but most were mid-doctorate (second to fourth year) and had published at least one paper. Two students (P22, P24) were near PhD completion and had already written three articles. One participant, P30, wrote their first paper during the course. Exactly a third of the participants were female. All the participants used English as their L2 and main language for publication. Informed consent was obtained from all participants. The first author was also the teacher of the course, which created a rapport and shared background with the participants, offering unique insight into context of the study (e.g. Crookes 1993).

Table 1. Disciplinary distribution of participants

<i>Broad disciplinary field</i>	<i>Number of participants</i>	<i>Participant Code</i>
Microtechnology & nanoscience	1	P1
Biology	1	P10
Architecture and Civil Engineering	2	P2, P17
Industrial and materials science	2	P3, P18
Chemistry	2	P8, P11
Technology management and economics	3	P9, P13, P21
Electrical Engineering	3	P19, P22, P27
Physics	5	P4, P5, P7, P16, P28
Space, Earth and Environment	5	P12, P14, P15, P24, P30
Mechanics and Maritime Sciences	6	P6, P20, P23, P25, P26, P29

3.2 Data collection and analysis

The data presented here was extracted from a larger dataset collected over two years for a project investigating ESP pedagogy from a cognitive perspective. During that study, it became apparent that a selection of the data warranted separate scrutiny through the lens of genre pedagogy. We stress that while the dataset in its entirety was collected for another study, the data presented here was extracted uniquely for this study using the criteria described below, and is not presented in any other publication.

Interviews were conducted on average 5 months after the participants completed the course and coincided with their submission of an RA for journal publication. All interviews were conducted by the first author, taped, transcribed, checked and anonymized prior to analysis. The interview protocol is provided in Appendix I. Interviews lasted on average 27 minutes.

Stimulated recall was used to ensure the students' accurate recollection of writing their RA (Gass & Mackey, 2000): with their own articles in front of them, students were asked to describe in detail section by section their strategy for writing these papers. This method ensured that participants' recollections were grounded in the actual texts written. These texts were not collected or analyzed, however, due to consent and privacy issues tied to co-authorship, and due to their status as high-stakes, highly specialized research.

Because of our focus on genre manipulation and agency, an important criterion in the selection of data was the idea of intentionality. For the purposes of the analysis, we operationalized genre manipulation as follows:

- Comments where students indicate deliberate authorial choices motivated by audience and personal rhetorical goals
- Comments where students report deliberate manipulation of typical genre conventions (as they perceive them)

To capture the dimension of control and affect implied in the development of a sense of agency, we also identified:

- Comments where students mention changes in their perceptions of writing or themselves as writers

The data analysis procedure was conducted by the two authors, who both selected and coded all the data, following the stages outlined in qualitative research methodology (Miles, Huberman, & Saldaña, 2014). To ensure that the coding was reliable, we first independently extracted comments meeting the above criteria from the interview database. After cross-comparison of our independent selection, we compiled a new dataset which included data from all 30 participants. The next step in the analysis was to identify themes within this dataset. This step was again conducted independently by the researchers, who each kept an analytic memo to annotate coding decisions and impressions derived from the analysis. After a second round of cross-comparison of our individual analyses, codes were jointly revisited, refined and verified in the data. Two final themes were identified (Table 2):

Table 2. Themes identified in the data

Genre manipulation	
As a response to:	As a manifestation of:
a. Perceived audience expectations	a. Control and empowerment
b. Desired rhetorical goals	b. Shifts in perception about writing and themselves as writers
c. Authorial preferences and critique of the genre	

4. Findings

Here, we present the data in accordance with the emergent themes.

4.1 Genre manipulations as response to audience, desired goals, and critique of conventions

All the participants provided evidence of genre manipulation in their writing—i.e. *intentional and metacognitive* adaptation of authorial choices in response to different audiences and specific rhetorical goals and personal preferences. Some students also reported evidence of genre critique—i.e. explicit problematization of genre-specific conventions.

4.1.1 Genre manipulation as response to audience expectations

In our data, students motivated their authorial choices with considerations of audience—which was often described as interdisciplinary or hybrid academic/professional. The comments below point to an awareness of the audience expectations in terms of genre conventions and show that students did not blindly apply the techniques learned in the course, but adapted and manipulated their rhetorical strategies according to the situation. For example, in (1,2) students describe how their primary goal in adapting their writing was to engage their specific readers, either by telling a story or shifting the focus of the paper:

- (1) When I was revising the paper I was trying to remind myself to think about who I wanted to communicate to, so this idea of telling a story and knowing who this story is addressed, to and thus also the need of persuasion, being able to engage the readers' attention and write the article in an interesting way. So, these were the new things for me. (P9)
- (2) I tuned a bit ... In each case you have to make some change ... [interviewer: so different audience in these two papers?] Yes. Different audience, this is more focused on the ideas-model development. (P23)

In the following examples (3,4), students similarly reflect on the journals and the groups of readers associated with these journals, and consider how their writing decisions both in terms of text organization and language choices were guided by considerations of the expectations of that specific audience:

- (3) So the journal that I am submitting to is the one that actually works with the second (field)..., so those people are actually more acquainted with these kind of literature. That's why I decided that I should introduce the other one first. That is another approach. (P22)
- (4) I got really good ideas how to change the language and make it more accessible for a broad audience [compared to a prior article produced by the participant], and it was aiming to architecture and architectural research, which I had never conducted before. (P17)

These decisions about genre manipulation in response to audience are not necessarily easy for students, particularly since students in STEM often address trans-disciplinary problems and write for multidisciplinary audiences (5,6).

- (5) [new paper is an article extension, for theoreticians?] Yes, so apparently I didn't think it through enough, because I was writing to industry again... so (broader disciplinary area), I'm basically picking from three different sub-fields, and using tools from them and I need to explain these three fields and it's kind of hard, because they don't really go well together. (you need to make an argument for that?) Yes, and, yes, so this is what I struggle with right now. Yes, I haven't really seen anyone do this (P28)
- (6) the structure of the articles can totally vary, what I read. There's people who are very technology-focused people, and then there's people, the geologists, who pump down... So all these people are probably coming from some disciplinary background, and depending on if they have published in these disciplinary backgrounds, they probably tend to have a different structure in maybe their thinking or in the way how they put their articles. And then there's people, like me, who come into this and then be like, okay, wow, I also have a disciplinary background, but I have never been in academia with this background. ... And then you try to, okay, what am I trying to do, what work is this, which structure do I actually adapt? (P27)

The quotes below (7,8) also show that writing with the “readers in mind” is not necessarily straightforward. Although students are conscious of the need to adapt their writing to their audiences, they do not always know:

- (7) You realise there are many dimensions, if you consider the reader. The first task, where you should describe your field, that was a reminder that here you can't be as detailed, you need to explain more openly to all audiences ... It's not always completely obvious, you think you're being clear when you're writing. It can be unclear for the reader. (P2)
- (8) I'm not sure if I have actually adopted the genre or the typical ways of certain papers, because this field is so interdisciplinary, that this is quite blurry. (P30)

Moreover, rhetorical decisions are often subject to negotiation with the supervisor (who often retains the power) (9):

- (9) I tried to make a shorter introduction where I didn't have this table of content paragraph, because we have that in abstract, but my supervisor told me that's actually not how we do it in this field, it's not optional. That's why we put it back in ... Then I think my supervisor thought it was too short, so yeah, I added it (contextualization) again, and then rewrote the bit to make it a bit shorter and a bit more specialized. But they wanted that motivation again rather than just state that we do this because this. So now there's a bit more of context again ... I could find a middle ground in the end. (P4)

4.1.2 Genre manipulation as response to desired rhetorical goals

Authorial choices were motivated by the students' own genre desired goals and personal preferences. Notice for instance how the students in (10,11) exploit the inherent variation within the genre to adopt rhetorical strategies that are not necessarily unconventional, but simply because these particular strategies appeal to them:

- (10) Newsworthiness, in the abstract where you say this is what we have done, this is why it's relevant. And then so to speak, mentioning it again in the conclusions. This has been shown in the article, this is the main message that we want to show. And I've noticed ... Actually, when I've gone to some of these conferences, the really good presenters from the really good universities, that's how they do it. (P5)
- (11) What I did was trying to maybe ... some specific things, like the different parts of the model and describing them, like, this is what we get from these equations ... I like the classical way of saying first the name of the... which figure it is, and then what it shows and then a short discussion of it, more descriptive. (P15)

Likewise, in (12,13) we see that students report deliberately “picking and choosing” from the variation they noticed while analyzing the research genre in their fields:

- (12) Well, I could look at the difference between the two papers, and take what I liked sort of from it ... (about a specific paper analysed) I think I like his writing more, in general, than the others ... it's sort of like a puzzle and everything is a piece. And then, yes, if you understand every piece, then you can understand sort of the whole thing. I tried to do a little bit like that. (P20)
- (13) Well we were presented with these different styles of abstracts, right? And I guess that I chose the one that... I don't remember the name, but that it was not only the results but also that was done like an introduction. That's the one I chose. (P26)

The following quotes further illustrate strategies for rhetorical appeal, stance and engagement markers that are manipulated deliberately on the basis of the writer's stylistic preferences (14-18), or the preferences of their research group and/or supervisors (17):

- (14) I've been thinking about every word I'm using. Can I use another word that describes this same thing better? With another nuance or not... I want to know what I'm writing. If the words I'm selecting are matching my perspective ... when I read papers, I pay attention. So I see, "Oh, this is interesting phrasing." Is it applicable for me? Or can I use it? (P18)
- (15) Yes, and from the style and these figures, I try to be a bit more aware of tenses and this “will be”, and “would” ... and there's boosters. That's interesting; I thought it was really good. So I try to do that. (P27)
- (16) When I was structuring my paper, like which section goes after, I was trying to follow them. (is that common?) I don't know. I've seen papers and that's why I did it. Maybe it's not so common ... It was a bit tricky writing this paper because I couldn't really take this to the results section. I had to explain it here. I don't know if it's good or bad. (P25)
- (17) And then in the end, we always do it like this, we have this contributions section. (genre convention?) No, it's, both my supervisors always do it like this. So, and I think it's very nice ... Yes, so I think both my supervisors do this and in our little group, with five people, I think all the papers look like this. Yes, I actually like it. I think it makes it clearer. (P28)
- (18) I like this. Even though it's leaner I think it's more correct and intuitive and informative, but maybe a beginner will disagree ... I'm pretty sure the audience is happy with this one, I'm also happy with it,

although I feel sorry for all the new students entering the field, like myself one year ago. I talk of things as if they were well-known results and they are well-known results. (P4)

As seen previously in (9), while students seem to take an agentive role in performing the genre, the supervisors (or co-authors) do not always validate their choices, and students seem aware of the challenges that come from manipulating genre to achieve the desired effect (19,20):

(19) I had one paper that used a lot of boosters, like, everywhere. And this is, like, my favorite research paper of all time, although I don't care so much about the topic, but I think the writing style is awesome and I was trying to use that, use boosters as often as I could when I was writing my new papers. It turns out my supervisor don't like it a lot. So, that's that. (P28)

(20) Sometimes I didn't agree with my co-author. So when I rewrote it, I think I added some things to sort of support, and I questioned some of (co-author) statements. Sometimes I still question some of the things, but it's a bit tricky I think, to get it really as you want it. (P8)

4.1.3 Genre manipulation, challenge and critique

The evidence pertaining to authorial choices presented thus far illustrates deliberate manipulation of the genre. In this section we present instances of genre manipulation that are explicitly motivated by the intention to challenge genre conventions, at times as a response to a critique of those conventions.

For example, manipulation of genre entails a critique of existing conventions for P10 (21), who adapts to the expectations of the journal, yet points out the flaws of those conventions ("it's really boring"; "you can't do it"):

(21) Yeah, my theory and method... I think it's really boring. I think it depends on the journal ... For instance, I really detailed everything I did, and I gave details from the equipment I used and some other people they use two or three lines to describe. They say that you should be able to redo the experiment we are reading. When have three lines you can't do it. But then if I was writing to a journal like this, it would be okay. (P10)

Often, perceived unconventional authorial choices pertained to minor aspects of the text, but crucially, these small manipulations were conscious (metacognitive) and explicitly motivated by the desire to write something original vis-à-vis existing genre practices. This intentional "breaking of the mold" is clear in (22):

(22) [used genre analysis?] Yeah. Actually, I break the template that I found, because they had a different structure. I mean, the articles I found for this topic, at least, in this kind of journal, is usually very short. So they don't follow this IMRAD structure ... But since I'm writing a bit longer paper, then I chose to stick with the IMRAD structure. (P1)

In some cases, these instances of manipulation take the form of small lexical choices, intended to convey stance, engage the reader, and even express playfulness. For example, in (23), the student describes examples in her articles where she tried to be creative (see underlined stance markers below). For this student, these small authorial choices were indeed a form playfulness:

(23) So for example to make the introduction appealing to the reader: desired effects" ... "resulted in an impressive control" ... "Unfortunately, several interesting coordinate-based designs of beam splitters (refs) and individuality cloaks (refs) rely on..." "Excitingly, transformation optics itself has also provided a valuable contribution"... "Unfortunately, the aforementioned transformation..." And here in the niche statements: "The exchange momentum between electromagnetic waves and matter is a fascinating effect with a long scientific history ... It has been proposed that xxx phenomena are a desired feature ... For a long time, optical forces were considered to be too minute for "terrestrial affairs"" (P29)

These attempts required a brave heart, and at times, students expressed reservations about their choices—wondering whether they had been too "bold" (24), struggling with their stance

markers (25), feeling “uncomfortable” about changing co-authored texts (26), and describing their writing as perhaps a bit “weird” for the genre (27):

- (24) The introduction is probably a bit bolder than it should have been or something like that ... so the details of the limitations are not in the introduction or perhaps they should be if you want to be very upfront and honest with your reader, I'm not sure. (P4)
- (25) I had issue with these boosters... How can I say it's novel, because my work is novel, but not for this application. I had lots of struggle for that one. If I say it's novel but my result doesn't show this one; they (Journal audience) can't say for sure. So if I can say in that way maybe I can get acceptance. (P19)
- (26) In my sections, it felt like I was kind of going more into detail in my results, and my colleague, she had more simplistic way, maybe conservative, yes. So there's probably a difference in style in that article. I also feel uncomfortable with changing the first author's sentences. (P27)
- (27) The conclusion's actually a little bit weird maybe, it's more like a summary, and it's also trying to pronounce again what is important about this work ... Usually we just summarize these results and then we say that they're important more or less. (Here) it was also a bit about the theory part again, and it is showing that it makes sense ... it also has a future outlook. (P15)

At other times, students took pride in these departures from convention. Critiquing the genre conventions they had observed from genre analysis, which they perceived as flawed or unclear, motivated their rejection of these typical patterns (28-30):

- (28) So many times you see people doing these studies and they get, oh here's an optimal design. And that's it. They don't say anything else. You haven't learned anything from the science. You've just said, oh, that is better. Yes, you can see it's better, but you can't say why. The bigger lesson comes when you can say it is better and it's because of this and this. And I'm going to do that for a journal paper in the future. I'm going to present results for an optimization, a bigger one than this, and show why these cases are better. (P5)
- (29) When I was writing, I was thinking if I was ... I took pieces of what we used, for example, in the introduction, and I used them in the two papers. ... Because some papers in my field I see that end abstract they just give information ... like (example). I kind of summarized what it was the paper, instead of just giving the information and results. (P11)
- (30) The introduction I made a lot of changes to. From reading other articles, I felt that they were not always very clear with the order of how they throwed in things into the introduction. Some things, I couldn't really understand why they were there, or what they wanted to say with that, so I changed it to better ... tried to make it a clear story of where I was going towards the aim and with the study. (P12)

As seen in examples presented in previous sections (9, 17, 19, 20), these challenges to convention were often negotiated with the supervisor or co-author (31,32):

- (31) One thing that I tried to do was to... In each chapter or section have a little bit of preliminaries, so sort of a bit of small introduction, which are sort of a little bit, maybe not super related to the paper, to facilitate... the reader. But (supervisor) said like it's too textbook stuff... I know my supervisor has one way of writing and maybe I have one way and then maybe we have to try and sort of cooperate. He's very experienced and I think he's kind of locked into his way a lot, so... He ... gets a bit uncomfortable, so he wants to... [conventional?] Yes. (P20)
- (32) I try to delimit my work a bit. I've already done some delimitations, but should be more. ... I'm quite new in the field, and what we're doing, is also maybe a bit more new, and the other person in the group is a bit more traditionalist and they're quite known in the field, so it's going to be hard, I guess. But still a good idea. (P30)

Overall, the examples of genre manipulation reported in this section suggest that students are aware of that fact that manipulation can be successful or questionable, and crucially show that they realize that their efforts may not lead to the desired effects. This realization is in itself an important goal of genre pedagogy.

4.2 Genre manipulation as a manifestation of control, empowerment, and shift in perceptions

To capture students' perceptions of agency (see section 2.2), we aimed to identify instances where students reported shifts in their perception about writing or themselves as writers. As mentioned, these perceptions of identity, or self-hood, are central in definitions of agency in writing (Ivanič, 1998). Some of the comments below also suggest that new challenges may arise from students' newfound awareness of genre conventions as tools to write. Nonetheless, students mostly reported feeling empowered by the awareness of genre conventions, as this awareness enabled them to develop personal writing strategies and formed the basis of their authorial choices.

4.2.1 Conventions as tools of control and writer empowerment

Students reported that gaining awareness of recurring features in genres—textual forms, argument patterns, and move structures—made them feel in control of their writing. The metaphors used by the students as they commented on the most useful take-aways from the course underscore this interpretation: tools, templates, roadmaps, tactics, boxes, and recipes. For example (33-36):

- (33) It's finding a way ... finding structure in your writing. Having kind of a template that is connected with the idea, the flow of your writing, rather than the specifics, like if you are like me and you PhD student, then usually you don't know how to start writing, you just start from the top of your head ... Rather, these are tools that you can use in various situations. If you know that they exist, then you might realize that this is a good tool for this moment (P1)
- (34) How to think around those things, many of those structural things. And then I realized now as well when starting writing a new paper that, okay, but it's easier to start writing when I know I have some kind of skeleton to build on. It's easier to get to that point. So that's, I think, something that's been helpful. (P7)
- (35) [Is it a frame of thinking?] Exactly. Most importantly, for not forgetting as an author or as a researcher, what you haven't touched. If didn't reflect for instance on limitations, if I didn't reflect on review and other views concerning how to problematize the gap and where I'm going to contribute and this kind of important and essential points that have to be considered. ... it gives a roadmap for how to... as you said the rhetoric strategy (P13)
- (36) I had two papers already, so I guess that (genre analysis) helped with learning how to write, basically... this is even easier to write, so it's hard to say how much is just new general experience, and how much come from taking the course. I think it would have been nice to take the course earlier in order to learn about some of these things before, to learn stuff in that way, instead of just trial and error. (P14)

It is clear from these comments that conventional patterns were perceived as strategies rather than constraints, i.e. useful methods for starting writing, monitoring and maintaining progress. This is emphasized also in (37,38):

- (37) Well I think many of them provided good tools to sort of get started with structure and things because there are all these templates for almost how to structure and organization the introduction and abstract and stuff like that. And I think that's really helpful not to get stuck in ... And sometimes it's really hard to figure out a way to get started or easy to let you end up in some kind of circular reasoning that's hard to get out of. So, I felt that helped a lot too. (P24)
- (38) Yeah, some structures, some patterns... I don't specifically remember their names, but I know that I'm using them. For example, I tell this is the problem, and this is the way it was addressed before, now I'm doing it in this way because it makes sense... What I learned from the courses is to identify patterns. ... So then I kind of understood. Okay, this is like a tool that almost everybody uses, so ... Now, when I have to present an idea I kind of know how the opening sentence should be, how should it should be closed and how to carry on to the next idea. (P22)

The following comments (39,40) also illustrate that students deliberately adapted what they had learned about RA genre conventions to control their own writing process:

- (39) Personally, these structures mean more, for each section, were really useful. So, you can sort of start to write at least something. You can set up here, I want this and this and this, and then you can go from there, basically. I think that really helped me out. (P16)

- (40) Because before the course you had a feeling that there was a structure, but no-one told you there was a structure, so it was very relieving to see that. ... yes, that you could see that there was that in the papers that we brought and the others. And when you tried to write, you tried to have that structure, but you didn't know what the name was of it. (P26)

In sum, while the students were following the genre “recipe”, the recipe was conceived as a means to an end rather than a goal in itself, as emphasized in the following examples: (41,42):

- (41) Yeah, the moves or the things that is sort of compulsory to have. And it is good because if you are at an initial stage reviews of these moves or actually you try to use all of these moves that are listed, suggested to use. And after that you can evaluate if you want all of them, if all of them fits. But at least it's a recipe, it's an initial recipe, that I like ... And then you can shape it in your, saying if you cook, you can use the recipe but according to your taste. (P32)
- (42) Although I used the material that you produced through the course that part was a starting point, but I had to modify it and develop it ... the discussion from the course would have automatically changed totally. But, you keep the basic plans ok, you keep the rules, as we did here. Because, here it's more like as if you are writing a text for a broader audience. (P3)

This perspective that conventions are subject to manipulation is even more evident in P15, who also underscores the idea of play:

- (43) So, I thought it was really helpful to have these boxes, building parts, and you could just take them and fill them in, so to speak, fill them with more content or play around with them. (P15)

4.2.2 Shifts in perceptions about writing and themselves as writers

The sense of empowerment over genre conventions emerging from the quotes presented so far was even more evident in the students' final comments about what they learned in the course. Many of them remarked positively about shifting perceptions about what writing is, and about themselves as writers.

The following quote (44) illustrates how P17's perception of her writing ability shifted towards an empowered position by knowing how to analyze and manipulate genres across audiences:

- (44) I got some kind of tools now, how to do it. Because I think when I started my PhD ... I know that audience so well, I have never reflected on why does it work. And then it stopped to work. And when I got like okay, I'm stuck and I can't publish anymore ... And then I was quite unsure. Maybe I have lost my ability to write or something. And so it was quite scary... and I think it was the audience and genre analysis that I needed to work on, and that was like an aha moment during the course. So now it feels like I'm just sending in articles, because now I know what to do with them, things are so much better now. (P17)

Other comments demonstrate students' enhanced reader awareness and the value of that awareness to them as writers. This was particularly the case for students who do not sit squarely within one discipline (45,46):

- (45) Since I work in this interdisciplinary field, I often get confused ... So this idea of telling a story and knowing who this story is addressed, to and thus also the need of persuasion, being able to engage the readers' attention and write the article in an interesting way. So, these were the new things for me. (P9)
- (46) Yes, to reflect with, “Who is going to read your paper?” I think this was also important for me because I'm between fields; I'm a bit of biology, a bit of chemistry. So, to think, I'm going to write a paper that is going to be to a journal that is more chemistry related, or I'm going to write a journal that is a bit more biology related ... so I can change a bit how I write it. (P11)

Both P5 and P19 express confidence, enjoyment and a sense of pride about successfully writing the RA, drawing on their new knowledge of the genre derived from the course (47,48):

(47) It's been fun, and I like writing and this paper here, I got quite a lot of hands-free from my professor. I wrote all of it basically myself, then I sent it to my supervisors and then they corrected a couple words. (P5)

(48) I also really like that I got all those tools ... I think I feel more mature... For example, when I wrote the article within one week, I knew exactly, more or less, this should be included in the introduction, here I need to occupy the niche or the territory... I used the toolbox, you know, that's why I could write that article within one week. So I have learnt a lot; I feel much more sure. (P19)

We also found evidence of changes in perceptions about research writing itself—its nature, its process, and its complexity. For example, P28 reported writing as “less frightening” and “less painful”, suggesting a more empowered stance deriving from this shift in perception (49), and P6 comments on the “power of writing” (50), conveying an increased sense of agency propelled by genre awareness:

(49) The more I learn about writing, the less frightening that monster would be. Initially in my PhD my writing was filled with a lot of anxiety ... so this is getting better So, sure, you can have some space for creativity, but I prefer to have a recipe for how to write well. And this course provided me with more of a recipe than what I had before, and I like that. I never really considered learning how to write well before this. (P28)

(50) You gained your awareness of writing and the power of writing ... I like to write, and I like to learn how to become a better writer. ... I like that. That you really want to write and do it good enough, so you don't need someone else to. When I wrote, I had in mind some things to sort of when you wrote the sentence, you sort of thought one extra time ... You thought can I express it in a way that makes it more as I want it to be? I evaluate ... you have this like parts in mind that you try to put them to “Okay, why is this? Why do I think this?” Or you react when you see something like “sharp contrast”. You don't only write contrast, you write sharp. These tiny things that makes the impression different. (P6)

Finally, while knowledge is power, it has its downsides. Metacognitive awareness of the possibility of genre manipulation brings a deeper understanding of the complexity of research writing (51), or as P18 observes, a realization and appreciation of the scale of the mountain:

(51) I think I've learned a lot from the course and it's improved my writing, but it has also made the task of writing much more difficult, because I need to be aware of more things. But at the same time, I think it's good to be aware, than to be ignorant about audience perception or what they can see into my writing ... Previously I could just write anything, but I didn't really know how to write ... Now I know how tall the mountain is. Previously I just went on hiking, didn't really know how tall the mountain was, but I really liked the part of the course that made me realize, there's no right or wrong. But there is a point to study what the others in your genre or your field, how they're writing. (P18)

5. Discussion and conclusion

In this study, we aimed to examine whether genre pedagogy stifles students' attempts at genre manipulation, or whether the approach can promote playfulness in writing, or at least an enhanced sense of control over conventions. To this end, we examined how students across STEM disciplines *intentionally* use genre knowledge/awareness in authentic writing contexts.

Our findings suggest that rather than pushing students towards conformity, genre pedagogy has the potential to foster students' agency in their writing. Whereas socialization is unquestionably the primary means to learn to write in a discipline, genre pedagogy can support and enhance this learning process, especially for those students who do not have a supportive network (Falconer, 2019; McMullan, 2018). While our students drew on genre conventions obtained through genre analysis, we found much reported evidence of manipulation—deliberate authorial choices motivated by desired rhetorical goals and/or varied audiences. This finding supports Cheng's (2018) description of the two desirable long-term outcomes of genre pedagogy: an increased knowledge of a specific genre(s), and the awareness of genres and of genre analysis as a heuristic when writing across different and dynamic contexts. This latter outcome can in fact be understood as metacognitive awareness of how to use genre knowledge agentively (see also Driscoll et al, 2019).

Some students also explicitly reported pushing back at genre conventions, sometimes timidly, and sometimes more boldly, as a form of genre critique. This type of manipulation was intentional and resulted in small textual choices that, in the eyes of the students, were unconventional. Examples are the deliberate use of stance and engagement markers, lexical choices dictated by style preferences, and content selection. Following Swales (2017, p. 251), we might therefore hazard that “matters of style” can allow us to “express our discontent with the status quo”. Although our findings present the students’ perceptions, further research could collect textual data, perhaps across different drafts, to illustrate more in detail how intentional genre manipulation manifests itself in textual solutions and changes.

While in our data critique of the genre spurred manipulation, it did not necessarily result in a break from convention. It was also clear that some of the students’ attempts at manipulation were quashed by their supervisors, inviting the question of which departures from convention are welcome, and who decides. In terms of genre pedagogy, this predicament further underscores the crucial role of ESP/EAP practitioners in educating gatekeepers—supervisors, subject specialists, and examiners—so that they can recognize implicit expectations about conventions (McGrath, Negretti & Nicholls, 2019) and the potential for variation. This recognition is fundamental, since the importance of genre manipulation as evidenced in our study is a sign of development towards writing expertise. As one of the leading scientists in Emerson’s (2017, p. 73) study noted: “There are conventions for writing in my discipline, but some of the most pleasant scientific articles break that mould ... I wouldn’t always follow them. It comes with a kind of maturity, knowing what way you can push the boundaries”. It follows then that genre knowledge may be a “black box” for many doctoral students (i.e. the outcome is visible, but the interior workings are not), especially in scientific fields, and its development should not be left purely to chance or socialization.

The key contribution of our study is empirical—our findings provide new evidence that genre pedagogy can contribute to the development of students as critical, agentive and metacognitive writers, willing and able to manipulate genres. In our data, these often small manipulations did not necessarily break convention; but for the students, they invariably constituted conscious rhetorical decisions, at times acts of self-defiance, and efforts to be creative within the genre. Unlike genre innovation, which needs to be recognised and validated by “expert members of the discourse community” (Swales, 1990), the locus of genre manipulation and creativity is the agentive and empowered writer. As Sternberg (2017, p. 290) on creativity observes: “Defying oneself is challenging because virtually everyone tends to become entrenched and tends to accept her own entrenchment”. Our paper therefore amplifies current calls for the promotion of creativity in research writing (see Tardy, 2016), and investigations into the role of genre pedagogy in that endeavor.

Our data illustrated students’ perceptions of genre manipulation and thus did not explore their (potentially evolving) views about broader socio-rhetorical practices in their field. It would be intriguing for further research to explore how newfound genre knowledge ties to students’ sense of socialization and identity in their fields, and whether they see the opportunity to manipulate their writing as a way to better socialize into the field. Secondly, since our interview data was collected some months after a genre pedagogy course, we cannot completely claim that our findings reflect solely the effects of genre pedagogy. During this time, students may have had multiple contacts with actors in their target communities, including face-to-face interactions with advisors, and as such developed their genre knowledge via socialization. Further research could also compare and contrast the ways in which students develop genre awareness naturalistically, via socialization, and through instruction, via genre pedagogy interventions.

Our final reflection is that—perhaps contrary to common stereotypes (Emerson, 2017)—emerging scientific writers seem to be conscious writers. They are interested in telling a good story, concerned about avoiding boring or pretentious writing, and at times gingerly innovative when it comes to genre conventions. Genre pedagogy, at least when it promotes an awareness of genre variation, does not seem to incline these writers to glumly obey genre as “law” (Derrida, 1980). Upending conventions too, we conclude by borrowing from Swales (2017, p. 251):

As academic and research English increasingly becomes a lingua franca, both in its forms and its varieties, as well as in terms of its participants, experimentation in both style and substance should be open to all the bolder-hearted, to all the malcontents of excessive and stultifying standardization, whoever they are, and wherever they be.

Acknowledgments

This study was partially supported by the Magnus Bergwall foundation [grant number 2016-01494] and the Åke Wiberg foundation [grant number H16-0110]. Heartfelt gratitude for their time and confidence goes to the participants. May the force be with you.

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Appendix I - Interview Protocol

1. A few months have gone after the course and you have completed your paper. During this time, was there anything that you have taken from the course that you remembered and used in your writing?
2. (using stimulated recall). Could you go through your article(s) section by section, and tell me if you applied any specific concept or strategy from the course, or from your own observations of the research genres in your field?
3. Thinking about the tasks we did, was there one that was especially helpful or stays in your mind? Why? (alternative follow-up prompt: ask about task that helped most to understand research writing in your field)
4. Any other comment?