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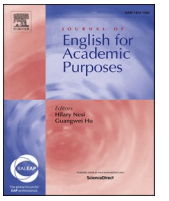

Rhetorical moves in teachers' PowerPoint presentations: Variation across disciplines and school stages

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ABSTRACT

This study examines the rhetorical characteristics of teachers' PowerPoint presentations, a commonly used yet underexplored genre in school language, across school stages (primary-secondary) and between disciplines. Although there have been empirical studies on the linguistic characteristics of other genres, such as textbooks, PowerPoint presentations have received very little attention despite their widespread use in educational settings. Using Swalesian genre analysis, the present study uncovered six moves and 37 steps in a corpus of 240 PowerPoint presentations, which were selected in a principled manner out of a corpus of school language, across an important phase of education, namely the transition from primary to secondary school. The findings revealed significant variations in the rhetorical structures of PowerPoint presentations across disciplines and school stages. One of the key findings was that secondary school presentations, which became more multifunctional, featured 'introducing the context' less while featuring other steps that sought students' contributions more than those of primary schools, highlighting the increase in comprehension demands for students. Our moves/steps framework for the PowerPoint presentations makes the rhetorical characteristics of PowerPoint presentations visible to teachers and trainers and has the potential to ease possible comprehension challenges of students across the school stages.

1. Introduction

PowerPoint, originally developed as a presentation tool for business and sales purposes, is now widely used in all educational settings from kindergarten to higher education globally (e.g., Liu et al., 2016; Zhao et al., 2014). As Adams (2006, p. 399) notes, "whether a teacher is intending it or not, PowerPoint's message of economy to students is: if it does not appear on a slide, it is probably not important because it did not warrant being pointed at powerfully. Here 'important' equates with high probability of appearing on a test." PowerPoint presentations form a hybrid genre that is inherently multimodal, involving written text that is prepared for oral presentation as well as other semiotic resources, such as visuals, to meet the multiple communicative purposes of lessons. In this study, we focus on the written text in PowerPoint presentations and analyse visuals only when they contribute to the informational content on slides. We have found that lesson presentations are prepared using a range of software, but the most ubiquitous by far is PowerPoint. This is the case to the extent that existing pedagogical research on lesson presentations uses the term 'PowerPoint' as a hypernym equivalent to the term 'lesson presentation' (e.g., Adams, 2006; Liu et al., 2016). Therefore, we use the term 'PowerPoint presentations'

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to refer to teachers' presentations that are prepared using a semiotic technology.

Our focus on the PowerPoint presentations is motivated by two reasons. First, despite the well-documented use and importance of PowerPoint presentations in school settings (e.g., Adams, 2006; Liu et al., 2016), there is a dearth of research on their rhetorical features in pre-tertiary settings, leaving these features opaque for teachers. Second, our previous research (Deignan et al., 2023) on a relatively large corpus of school language showed that PowerPoint presentations were the most commonly encountered genres in terms of the number of texts and tokens both at the end of primary school (years 5 and 6 in England) and at the beginning of secondary school (years 7 and 8), which necessitates a systematic genre analysis to provide implications for designing PowerPoint presentations for teachers and teacher trainers.

The aims of this study are twofold. First, we propose a taxonomy of the rhetorical structure of PowerPoint presentations that are used in primary and secondary schools. Second, we investigate rhetorical variation in PowerPoint presentations between late key stage 2 (primary school) and early key stage 3 (secondary school) as well across the disciplines of English, mathematics and science to make the common ways of meaning-making in this genre visible and explicit for teacher training and professional development purposes. This paper also provides a methodological contribution to Swalesian genre analysis by (1) showcasing the importance of analysing both extensiveness of moves and their number of occurrences in texts, which provides a comprehensive picture of the rhetorical structure of genres and by (2) identifying multisemiotic moves/steps that we define as multimodal rhetorical units that achieve a communicative purpose by combining text and visual resources.

2. Literature review

2.1. School language

School language refers to the language used by both students and teachers in classroom settings for the purpose of any educational activities (Schleppegrell, 2012) and "differs from the language used in ordinary interaction about everyday things" (Fang et al., 2006, p. 248). Much of the research on school language, particularly studies with a case study design, is rooted in Halliday's (1978) systemic functional linguistics (SFL) theory, which holds that language has three metafunctions that consist of ideational (concerned with content), textual (related to organisation) and interpersonal (concerned with social relations) metafunctions. These metafunctions, for instance, realise two main units of pedagogic discourse: (1) regulative discourse,[1] which is concerned with the management and organisation of classroom activities; (2) instructional discourse, which addresses "the content being" covered (Christie, 2002, p. 3). Drawing on SFL, Christie (2002, p. 3) notes that "pedagogic discourse can be thought of as creating curriculum genres and sometimes larger unities referred to as curriculum macrogenres". By analysing primary and secondary school classroom talk, Christie (2002, p. 100) put forward a commonly used model of a curriculum macrogenre that consists of "curriculum initiation", "curriculum collaboration/negotiation" and "curriculum closure", which involves the stages of teacher instructions, disciplinary meaning-making by students and teachers, and independent student work, respectively. SFL researchers also propose a genre-based pedagogy in which the teaching/learning cycle (TLC) has three main phases that are 'deconstruction' (the teacher modelling the text), 'joint construction' (the teacher and students negotiating the text) and 'independent construction' (students do independent work), and each phase involves 'setting context' (Rothery, 1994). Although genre-based pedagogy was originally proposed for teaching writing, this has been extended to reading and writing in other disciplines (e.g., Martin & Rose, 2005).

Previous research also revealed the language demands of different disciplines, building upon SFL (e.g., Fang et al., 2006; Fang, 2012; He & Forey, 2018; Schleppegrell, 2012; Wilkinson, 2019). Fang (2012), for instance, noted that school science is characterised by dense academic words and phrases as well technical vocabulary. Although SFL-oriented studies provided valuable insights into language demands of disciplines, they tended to rely on small data samples. Research on school language using corpus linguistics techniques mostly focused on textbooks (e.g., Green, 2019; Greene & Coxhead, 2015). Our study extends the previous research on school language and diverges from them in two ways. First, we analyse a corpus of PowerPoint presentations, an underexplored but increasingly important genre of schooling, which was selected in a principled manner. Second, our focus is on variation in moves/steps of the PowerPoint presentations between the primary and secondary schools in three disciplines. This necessitates a corpus-based move analysis, using both quantitative and qualitative methods. We examine school language at the transition which is well-documented to be fraught with social, academic, and emotional challenges in many countries (Jindal-Snape et al., 2020) to provide practical implications for teachers and teacher trainers to ease any potential challenges concerned with students' comprehension of the genre of PowerPoint presentations.

2.2. Swalesian genre analysis and PowerPoint presentations as a genre

Genre analysis has proved an effective analytical framework for making rhetorical structures of texts visible to the new members of the community in academic discourse (Swales, 1990, 2004). According to Swales (2004), a rhetorical structure of a text consists of (a) moves, that are defined as "discoursal or rhetorical units performing coherent communicative functions in texts" (pp. 228–229), and (b) steps, that are described as text fragments contributing to achieving the communicative purpose of the move. While moves are more general, such as 'establishing a territory', steps are framed more specifically, such as 'making topic generalisations'. Moves and steps

[1] Christie (2002, p. 3) uses the term 'registers' rather than discourse.

are identified through functional analysis that requires close reading of texts and manual coding, since move is a functional construct rather than a formal one (Swales, 2004); however, lexico-grammatical features in texts could aid the identification of moves (Moreno & Swales, 2018).

Swales (2004) originally applied moves and steps analysis to investigate the rhetorical structure of research articles (RAs) to help second language and novice academic writers to write RAs more effectively. Since then, Swalesian genre analysis has been employed to research both written and spoken academic genres (e.g., Cotos et al., 2017; Kanoksilapatham, 2005; Lee, 2016; Lim, 2006). Using Swales' (2004) framework for genre analysis, researchers have examined the rhetorical structures of PhD defences (Mežek & Swales, 2016; Swales, 2004), university lectures (Lee, 2016), PowerPoint presentations of lecturers at university (Feng, 2021); PowerPoint presentations of university students (Lindenberg, 2023), conference presentations (e.g., Rowley-Jolivet, 2002), and three-minute thesis presentations (e.g. Hu & Liu, 2018). Most previous studies focused on research genres at university level.

Lee's (2016) study of academic lectures is of particular importance here, since academic lecture is a pedagogical genre, and its primary aim is to convey subject content to students, as in PowerPoint presentations in this study. Lee (2016, p. 111)'s study demonstrated, methodologically, "the power of Swales' move analysis as a robust and relevant tool that can extend the analysis of classroom discourse beyond the IRF [initiation-response-feedback], offering valuable insight into the communicative functions, rhetorical organization" of classroom discourse. Likewise, Hu and Liu (2018) investigated the rhetorical structure of the 'Three Minute Thesis' (3MT) presentation as an academic genre. Similarly to Lee (2016), they used Swales' (1990, 2004) framework to analyse moves and steps in a corpus of transcribed recordings of 142 3MT presentations. Methodologically, the combination of qualitative (e.g. qualitative move analysis) and quantitative (e.g. logistic regression analysis) methods proved fruitful in identifying and comparing rhetorical discourse structures in the dataset. Focusing on university lectures in a single discipline, linguistics, at a university in China, Feng (2021, p. 183) conducted a move analysis of 33 PowerPoint presentations and found that the moves of 'headline', 'explanation' and 'concept-definition' occurred in all the presentations. The strength of this study lies in its multimodal analysis that uncovered image-text relations in lecture presentations.

As reviewed in this section, very little is known about the rhetorical structure of PowerPoint presentations in pre-tertiary settings. Furthermore, much less is known about rhetorical variation across disciplines and, crucially, variation on either side of the transition from primary to secondary school. The present study aims to address these gaps in the literature, by uncovering the rhetorical structure of PowerPoint presentations across the transition from primary to secondary school in the disciplines of English, mathematics, and science, using corpus-based genre analysis. Since PowerPoint presentations are delivered to both L1 (first language) English-speaking students and students who learn English as an additional language (EAL) in schools, and contain discipline-specific knowledge, it is important for both EAP and ESP scholars to examine their rhetorical structure in order to provide pedagogical insights.

3. The study

This exploratory study addresses the following two research questions.

(1) What are the rhetorical moves and steps in a corpus of PowerPoint presentations?
(2) To what extent, if any, is there variation in the rhetorical structure of PowerPoint presentations across the disciplines and school stages?

3.1. Research context and corpus of PowerPoint presentations

Our corpus consisted of PowerPoint presentations that were prepared using PowerPoint or similar software at key stage 2 (year 5 and 6) and key stage 3 (year 7 and 8) collected from eight primary and five secondary schools in the north of England. All these schools, following the national curriculum guidelines, are state-funded schools attended by L1 English-speaking and EAL students. Students' first language background was not collected at the partner schools since our focus was on the resources all students encountered. It has been found that not only EAL students but also L1 English students, especially those from low socioeconomic status (SES), have difficulties in comprehending disciplinary school language (e.g. Schleppegrell, 2012). The mean percentage of free school meal (FSM) eligibility, commonly used as a proxy measure for low SES, was 18% for both the primary and secondary schools in our study (DfE, 2024). Teachers at our partner schools informed us that typically PowerPoint presentations are created in collaboration and shared

Table 1
The corpus of PowerPoint presentations.

Key stage	Discipline	Number of presentations	Mean text length (tokens)	SD text length	Tokens
Key stage 2 (primary)	English	40	405.6	298.35	16,224
	Mathematics	40	477.48	311.39	19,099
	Science	40	538.7	319.96	21,548
Key stage 3 (secondary)	English	40	772.03	473.48	30,881
	Mathematics	40	523.23	350	20,929
	Science	40	564.15	399.70	22,566
	Total	240	546.86	401.6	131,247

among colleagues rather than single-authored; hence, no personal data was collected from individual teachers. This study focuses on the disciplines of English, mathematics, and science as these are among the core subjects considered "helpful for highly selective university entry" in England (Dilnot, 2016, p. 1102).

Table 1 shows the characteristics of the PowerPoint presentations. We used a corpus of PowerPoint presentations that are part of a larger written corpus of primary and secondary school genres (Deignan et al., 2023). This larger corpus represents a wide range of school language genres collected from 13 schools, including worksheets, assessments, textbooks, glossaries, and PowerPoint presentations that students encountered at the end of primary school (years 5 and 6) and the beginning of secondary school (years 7 and 8) in England. ProtAnt (Anthony & Baker, 2015), corpus software, was utilised to select the most prototypical 40 PowerPoint presentations for the combination of each key stage and discipline separately with reference to the other academic school genres that included worksheets, assessment tasks, glossary, fiction, textbooks, and reading extracts from the key stage 2 (KS2) and key stage 3 (KS3) written corpora. ProtAnt (Anthony & Baker, 2015) was employed to select PowerPoint presentations out of a larger corpus for the following reasons: (1) ProtAnt allowed us to select the most typical PowerPoint presentations for each discipline and key stage, separately, on the basis of keywords in the subcorpus of PowerPoint presentations compared against the other school genres in the corpora, avoiding any researcher bias in selection of texts (see supplementary file for top 10 keywords). (2) ProtAnt enhanced the representativeness of our data by selecting a prototypical and manageable set of presentations for qualitative analysis of their rhetorical structures. In addition to providing keywords, ProtAnt ranks texts by the number of (normalised) keywords they contain. We selected the presentations with the highest number of keywords because a higher number of keywords indicates greater prototypicality of presentations (see Anthony & Baker, 2015).

3.2. Identification of moves/steps in PowerPoint presentations

The stages of doing a corpus-based move analysis recommended by previous research (Biber et al., 2007; Cotos et al., 2017) were followed. First, while collecting data from our partner schools, we asked the teachers about the communicative purposes of these presentations. The teachers informed us that they were used in almost every lesson and were designed to achieve multiple purposes of learning, such as conveying information, asking students questions, and conducting formative assessment. We took these teachers' perspectives into account when delineating moves. Second, the first author read each presentation to familiarise with its content and communicative purposes, took notes regarding the rhetorical purposes of the segments of PowerPoint presentations, developed the initial rhetorical framework and coded 50 randomly selected presentations (21% of the presentations in whole corpus). Because there is no previous study of the moves/steps framework of PowerPoint presentations in school settings, the steps were identified in a bottom-up manner based on the functions of segments in PowerPoint presentations (see Table 2) and then grouped into the moves. When the same step/move continued to the next slide, those segments were coded once as part of one step/move, and we reported both the range and extensiveness of moves (see Fig. 1 and Table 3). Third, in order to ensure rigour and inter-rater reliability of our coding, another researcher in applied linguistics coded the same 50 randomly selected presentations, independently, utilising the initial rhetorical framework. We coded the moves/steps of PowerPoint presentations, using NVivo 12 (QSR International, 2018). Fourth, we discussed our coding, the initial rhetorical framework and resolved any discrepancies of our coding in a meeting. The percent agreement of coding for the 50 presentations was 86%, exceeding the 80% threshold suggested by Miles and Huberman (1994) for acceptable inter-coder reliability; however, thresholds for inter-coder agreement vary in the literature (Brezina, 2018). Fifth, based on the discussion, the first author refined the rhetorical framework (see Table 2) and coded the moves/steps of all the presentations. In addition to coding textual moves/steps, we identified two multisemiotic steps 'presenting terms or processes with a multimodal or visual resource' (M2S7) and 'encouraging multimodal or visual interpretation' (M3S5).

Our qualitative analysis of the functions of PowerPoint presentations was rooted in Swales' genre analysis (1990). In the literature on genre analysis, descriptors, such as 'obligatory' and 'conventional' were utilised to refer to moves/steps that occurred in 100% and between 100 and 66% percentage of texts, respectively (e.g. Kanoksilapatham, 2005). In this study, 'very common' (VC), 'common' (C), and 'less common' (LS) categories were used to describe moves/steps that occurred in at least 70%, between 69% and 40% of the presentations and less than 40% of the presentations, respectively, to refrain from value judgements that may be conveyed through the descriptors of 'obligatory' or 'conventional' (Wang, 2023).

3.3. Statistical analysis

This study provided descriptive statistics for both the range of moves/steps (Fig. 1) in presentations and extensiveness for moves (Table 3). Extensiveness is defined as the proportion of coded tokens of a move in a presentation to the total tokens in a presentation (see Yu & Bondi, 2017). We normalised this measure per 100 words per presentation for ease of interpretation. In genre studies, most of the previous research focused on presence versus absence of moves/steps. Although this information is crucial, it gives partial and dichotomous information. For example, 'introducing the context' (M1) was the second most common move occurring in 93% of all the presentation in our corpus, but it was not the second most extensive. Rather, its mean extensiveness measure indicates that its extensiveness was closer to that of M5 rather than more common moves (M2 or M3). Therefore, to provide a complete picture of the move structure and increase the rigour of our analysis, we presented both measures. In inferential statistics, we used normalised extensiveness as the dependent variable because moves inherently occur in a continuum rather than in a binary construct. For six moves, we aimed to build six separate linear mixed-effects models to take into account random variation in extensiveness that could stem from 13 schools that provided data in this study. We utilised the *lme4* package (Bates et al., 2015) in R (R Core Team, 2023) and included the random effect (schools) as well as the interaction of key stage (KS) and discipline as fixed effects. We then selected the

Table 2
Our rhetorical framework for moves/steps in PowerPoint presentations.

Moves	Steps	Description	Examples[a]
M1. Introducing the context	M1S1. Presenting learning objectives	Statements of what students are expected to do at the end of the lesson.	*LOs: To define the terms chemical and physical property.*
	M1S2. Repeating learning objectives previously presented	Repetition of the learning objectives within the same presentation.	*LOs: To define the terms chemical and physical property*
	M1S3. Presentation headline	The main heading of a presentation.	*Relative Clauses*
	M1S4. Presenting key words	Presentation of key words without definitions or examples.	*Key words: protagonist - media - text - film trailer - analyse - techniques*
M2. Breaking down disciplinary content	M2S1. Defining vocabulary	Definition of a single word or multi-word sequences.	*A habitat refers to a specific area or place in which animals and plants can live.*
	M2S2. Describing or elaborating on the subject content	Presentation of the informational content related to the subject.	*The Earth travels around the Sun once every year.*
	M2S3. Presenting a quote or text	Presentation of a reading text or a quote by an author or a scientist.	*"… for never was a story of more woe than this of Juliet and her Romeo."*
	M2S4. Presenting the subject content through analogy	Drawing on everyday knowledge to unpack terms.	*Electric current is like a loop of rope.*
	M2S5. Communicating reasoning or justification	Explicit presentation of analytical reasoning or a cause-effect relationship.	*Proportion can be made into fractions so you can compare relative sizes.*
	M2S6. Providing examples	Exemplification of terms/concepts.	*Magnetism is another example of a non-contact force.*
	M2S7. Presenting terms or processes with a multimodal or visual resource	Referring to a multimodal/visual resource when describing terms/processes.	
	M2S8. Repeating subject content previously presented	Verbatim repetition of the subject content within the same presentation.	*The Earth travels around the Sun once every year.*
M3. Promoting teacher-student interaction	M3S1. Seeking factual information	Questions or tasks that aim to elicit factual information.	*What is an adjective?*
	M3S2. Seeking examples	Questions that aim to elicit examples from students.	*Can you think of any examples of things that are reactive?*
	M3S3. Encouraging reasoning or justification	Questions that aim to elicit reasoning or justification.	*Why do plants disperse their seeds?*
	M3S4. Seeking ideas or opinions	Questions or tasks that aim to elicit students' opinions/ideas. This step also includes brainstorming.	*What skills do you think are needed in an interview?*
	M3S5. Encouraging multimodal or visual interpretation	Questions or tasks that aim to elicit understanding or interpretation of multimodal/visual resources.	*What are the common features of the pictures you have seen?*
	M3S6. Building on students' life experiences outside of school	Questions that draw on students' life experiences.	*Can you remember an occasion when you had limited time?*
	M3S7. Checking overall understanding	Questions that aim to check students' understanding of the content.	*What have you learnt?*
	M3S8. Repeating any steps from 3.1 to 3.7	Verbatim repetition of the questions within this move within the same presentation.	*What is an adjective?*
M4. Guiding student-student interaction	M4S1. Seeking factual information in a pair or group task	A pair/group task that aims to elicit factual information.	*In learning partners, please define:* • *contributions* • *efficient*
	M4S2. Encouraging reasoning or justification in a pair or group task	A pair/group task that aims to elicit analytical reasoning or justification.	*Think, Pair, Share: Why might they have become extinct?*
	M4S3. Seeking ideas or opinions in a pair or group task	A pair/group task that aims to elicit students' ideas/opinions.	*What do you think? Discuss with a partner.*
	M4S4. Encouraging multimodal or visual interpretation in a pair or group task	A pair/group task that aims to elicit students' understanding or interpretation of a multimodal/visual resource.	*Working in a pair, look at the job adverts in front of you. Annotate them with an explanation of what information is on them.*
	M4S5. Building on students' life experiences outside of school in a pair or group task	A pair/group task that aims to draw on students' life experiences.	*In pairs, discuss* • *What is the best tourist attraction you have been to?*
	M4S6. Encouraging writing or multimodal production in a pair or group task	A pair/group task that asks students to create a multimodal output or do writing.	*In groups of 4 you need to create an advert for one of these everyday household items.*
M5. Organising other activities	M5S1. Providing instructions on receptive skills or hands-on activities	Asking students to do reading, listening, research or hands-on activities.	*Read the extract from The Castle of Otranto.*
	M5S2. Encouraging writing or multimodal production in an individual task	Asking students to create a multimodal output or do writing independently. The imagined audience is not necessarily the teacher.	*Design an anti-smoking warning message to go on packets of cigarettes in the UK.*

(*continued on next page*)

Table 2 (*continued*)

Moves	Steps	Description	Examples[a]
	M5S3. Building intra- and inter-lesson connections	Making connections between the slides in a lesson or between different lessons.	*Last lesson we learnt about blogs, a type of transactional writing.*
	M5S4. Motivating students	Intention to motivate students, through motivational quotes or links to future career goals.	*Habits of mind. 1. Persisting Stick to it! Persevering in task through to completion; remaining focused.*
	M5S5. Repeating any steps from M5S1 to M5S4	Verbatim repetition of any content within this move within the same presentation.	*Read the extract from The Castle of Otranto.*
M6. Assessing students' learning	M6S1. Providing instructions on assessment	Introducing students to assessment or a quiz	*This quiz will test you on the percentage of DNA that we share with other living things.*
	M6S2. Presenting assessment criteria	Inclusion of formative or summative assessment criteria.	*L5/Grade E - solve simple problems involving ratio*
	M6S3. Providing feedback or answers to assessment or quizzes	Inclusion of short feedback or answers to assessment or quizzes without description or explanation.	*Answer = 499.95.*
	M6S4. Encouraging students to engage in self or peer assessment	Asking students to evaluate or assess their or peer's work	*How well did you do? Put a red, yellow or green dot next to objectives.*
	M6S5. Providing instructions on homework	Giving students guidance on homework or extended learning.	*Homework* *Answer the questions on the sheet.*
	M6S6. Repeating any steps from 6.1 to 6.5	Verbatim repetition of any content within this move within the same presentation.	*How well did you do? Put a red, yellow or green dot next to objectives.*

[a] We only provide short extracts as examples due to space limitations.

model with the smallest Akaike information criterion (AIC) value since this indicates a balance between goodness of fit and model complexity with "as few variables as possible" (Brezina, 2018, p. 124). We fit linear regression models only for M1 and M6 extensiveness because the mixed-effects models showed no random variation attributed to schools or resulted in a singular fit.

We also used an exploratory data analysis technique called correspondence analysis to explore the relationship between the occurrence of steps (in percentages) and key stages and disciplines together. Correspondence analysis is a dimension reduction technique that summarises multivariate data of high dimensionality in a lower dimensional space, while preserving the characteristics of original data to a great extent (Greenacre, 2017). The strength of correspondence data analysis lies in its visual depiction of relationships between multiple categories in a plot in a few (usually two) interpretable dimensional spaces (Greenacre, 2017). We utilised correspondence analysis for steps because there was not enough data for steps to employ inferential statistics in the presentations. The *ca* (Nenadić & Greenacre, 2007) package in R was employed for correspondence analysis, and an asymmetric plot was preferred over a symmetric plot as Greenacre (2017) notes that an asymmetric plot allows for direct interpretation of associations between row categories (steps) and column categories (key stages and disciplines combined). We included 28 steps (rows) out of 37 steps and six columns (KS2_English, KS3_English, KS2_Maths, KS3_Maths, KS2_Science and KS3_Science) in the analysis but removed nine steps since they occurred in less than 10% of all the presentations in our corpus. The two dimensions identified through correspondence analysis explained 65.52% variation in the data. The interpretation of the plot is as follows: Data points near the centroid (0, 0) were not distinctive, which means that steps near the centroid occurred in similar percentages across the categories. Data points that were further from the centroid contributed to the variation most. Additionally, the acute angles between the black and grey lines indicated stronger associations between steps and the key stages/disciplines.

4. Results

4.1. Moves and steps in PowerPoint presentations

The first three moves we identified (M1, M2, M3) were present in at least 90% of the presentations in KS2 and KS3 subcorpora and the whole corpus, as shown in Fig. 1. Compared with the first three moves, the fifth move 'managing other activities' and sixth move 'assessing students' learning' were less common and less extensive in the corpus, as seen in Table 3. The least common move in both the whole corpus and in KS2 and KS3 presentations was the fourth move 'organising student-student interaction' whose range remained stable across the key stages.

Fig. 2 suggests that Dimension 1 (horizontal axis) may represent a continuum from narrative/descriptive discourse to analytical discourse. This is suggested by the positioning of the steps: 'presenting a quote or text' (M2S3) and 'building on students' life experiences outside of school' (M3S6) appeared on the far left, whereas 'presenting feedback or answers to quizzes or assessments' and 'communicating reasoning or justification' (M2S5) were on the far right. Dimension 2 (vertical axis) may represent a continuum from regulative/procedural discourse to reinforcing curriculum deconstruction and construction. The steps 'repeating learning objectives previously presented' (M1S2) and 'providing instructions on homework' (M6S5) were located in the lower section of the graph, while 'repeating any steps' within the move 'promoting teacher-student interaction' (M3S8) and 'presenting key words' (M1S4) appeared in the upper section.

4.1.1. Rhetorical variation in PowerPoint presentations across disciplines and school stages

M1. Introducing the context serves the function of introducing the presentation, mainly through presenting learning objectives

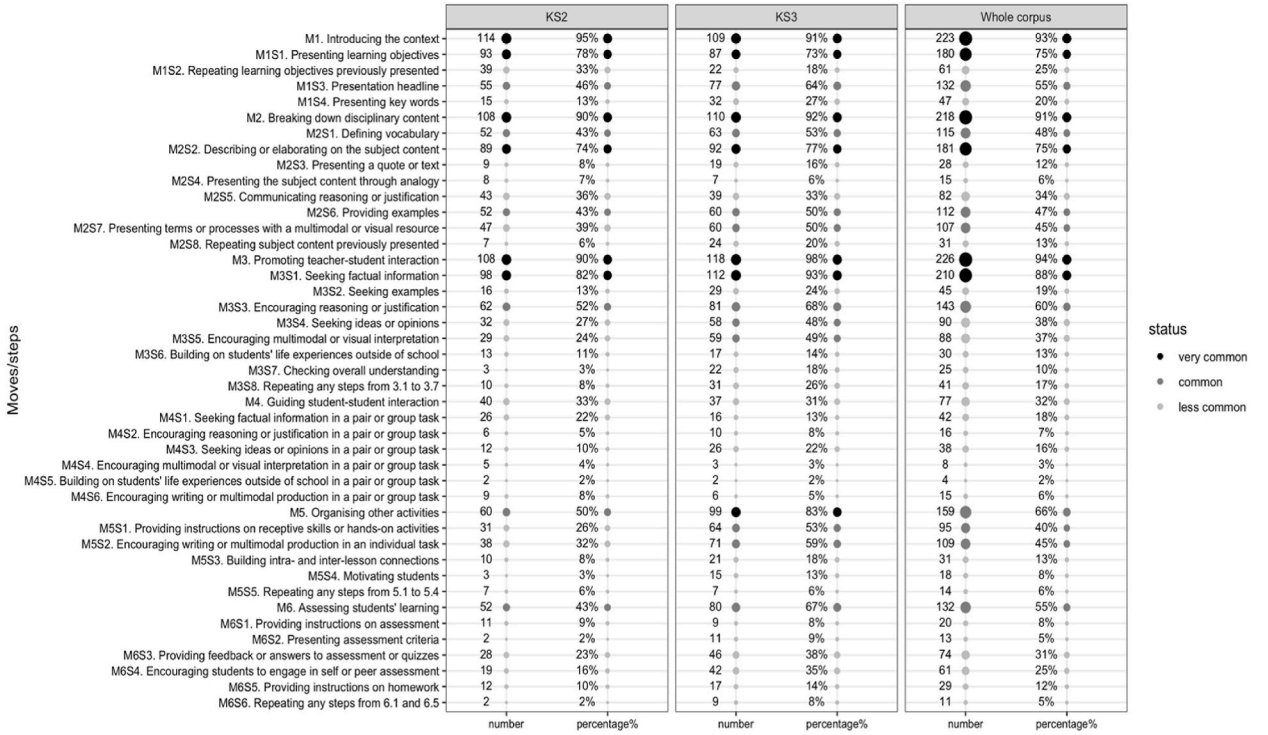


Fig. 1. The number and percentages of presentations containing the moves/steps (range) in the KS2 presentations ($n = 120$), KS3 presentations ($n = 120$) and whole corpus ($n = 240$).

and presentation headlines at the beginning. As Example 1 illustrates, the learning objectives provide a framework for the lesson and orient students for the disciplinary content. In this example, the overall disciplinary content and what is expected of the students were shown at the beginning of the presentation.

(1) Learning Objectives
- To recognise words ending in 'ible' and 'able'
- To explain the 'able' rule
- To use these words in sentences. (KS2_English)

The linear regression model revealed that KS3 was a statistically significant negative predictor of extensiveness of M1 (see Table 4), indicating that this move was significantly less extensive in KS3 presentations than in KS2 presentations, irrespective of disciplines. This finding suggests different practices in PowerPoint presentations between the end of primary school and the beginning of secondary school at the transition stage, which may pose a challenge for secondary school students who were used to being presented with the context at the beginning of the presentations. However, it is worth noting that the effect size in this model was very weak.

The most common step within this move in our corpus was 'presenting learning objectives' (M1S1) which was associated with KS2 mathematics and KS2 science presentations (see Figs. 1 and 2). The step M1S1 was followed by a presentation headline (M1S3). However, surprisingly, this step was not very widespread in that 55% of the presentations in our corpus included a headline. Less common steps were 'repeating learning objectives' (M1S2) and 'presenting key words' (M1S4). Consistent with 'presenting learning objectives', M1S2 was present in a greater number of presentations at KS2 than KS3 and associated0 0with KS2 mathematics presentations (see Fig. 2). This implies that through greater verbatim repetition of learning objectives at KS2, primary school students had stronger orientation to the lesson than secondary school students. On the other hand, KS3 presentations included the step M1S4 in a greater number of presentations than KS2, but its presence was rare overall. M1S4 showed an association with both KS3 English and KS3 Science (Fig. 2), suggesting that students at the beginning of the secondary school were expected to remember or learn terms to a greater extent than secondary school.

M2. Breaking down disciplinary content was the most extensive move in the whole corpus and characterised by its disciplinary informational content. On the slides, delivering disciplinary knowledge was fragmented in that it was realised through eight different steps; hence, we formulated this move as 'breaking down disciplinary content'. Example 2 provides a representative instance of this move that describes and elaborates on the content. The sentence in example 2 elaborates on the term 'elements' that was introduced earlier in the presentation, by providing factual information.

Table 3
Descriptive statistics for extensiveness of moves in tokens (normalised per 100 words per presentation)[a].

Moves	Whole corpus		KS2		KS3		KS2_ English		KS3_ English		KS2_ Maths		KS3_ Maths		KS2_ Science		KS3_ Science	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
M1	10.7	10.40	12.15	10.56	9.25	10.07	11.94	10.38	12.92	12.87	12.48	10.84	7.36	8.41	12.03	10.73	7.47	7.27
M2	35.32	26.11	40.54	28.24	30.10	22.73	37.28	23.83	28.56	22.94	32.23	29.03	22.22	17.40	52.10	28.34	39.53	24.28
M3	34.36	23.19	30.17	22.85	38.54	22.86	30.89	23.24	29.07	19.37	38.56	25.12	54.04	22.92	21.07	16.26	32.52	17.84
M4	3.75	10.26	5.58	13.72	1.93	4.03	6.67	15.38	3.07	3.34	4.86	15.32	0.53	2.08	5.20	10.08	2.18	5.53
M5	8.15	10.51	6.04	10.04	10.25	10.59	6.55	11.85	14.71	10.14	4.39	7.81	6.93	9.80	7.18	10.09	9.10	10.49
M6	7.14	12.27	4.88	9.29	9.39	14.34	6.34	13.04	11.07	16.07	6.24	7.26	8.51	10.91	2.08	5.36	8.59	15.69

[a] Due to rounding, not all the mean value columns will add up to exactly 100.

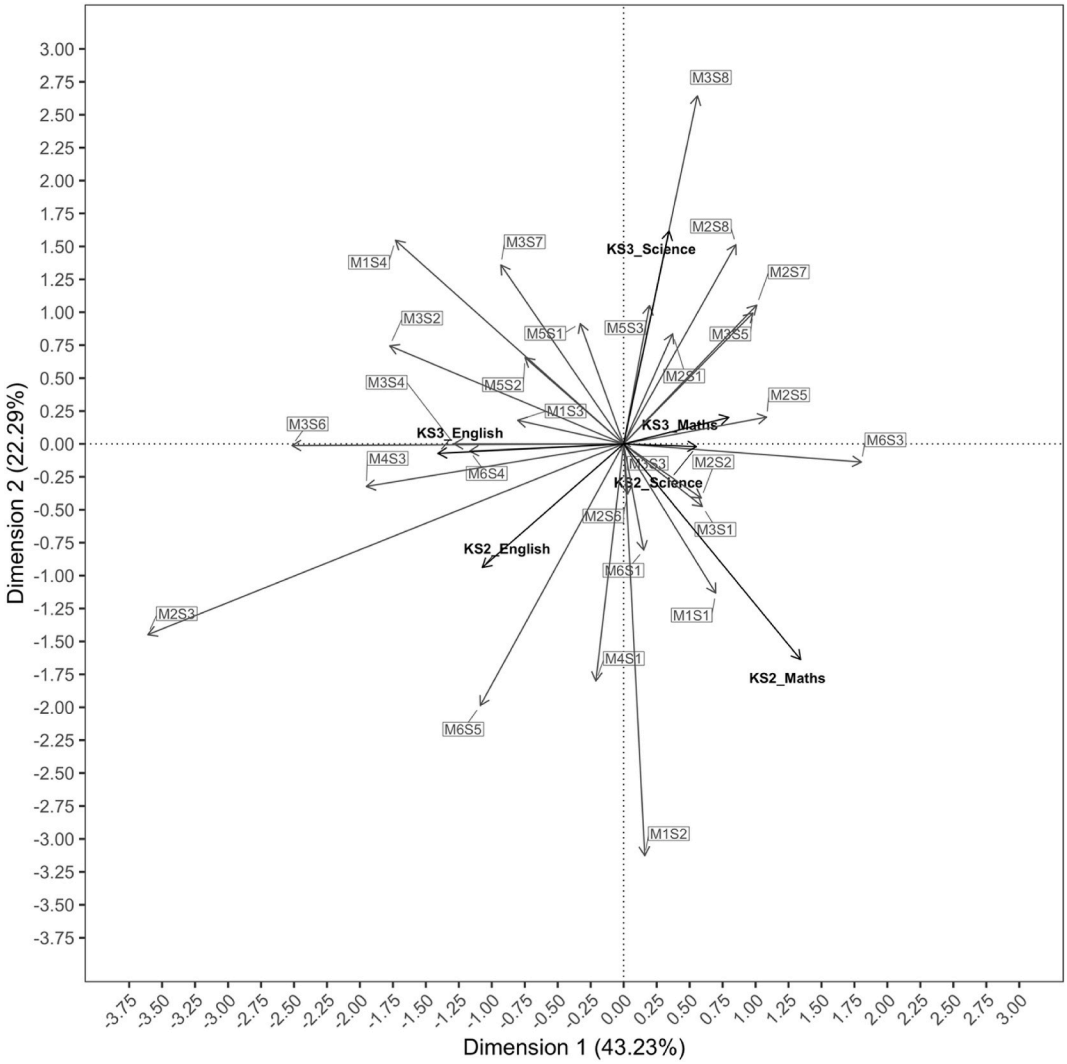


Fig. 2. A correspondence analysis plot of the relationships between steps and key stages/disciplines.

Table 4
The results of the regression model for M1.

Predictors	Estimates and 95% CI	*SE*	*t*	*p*
Intercept	12.15 [10.29, 14.01]	0.94	12.89	< 0.001
KS [3]	−2.90 [-5.53, −0.28]	1.33	−2.18	0.030
R^2/R^2 adjusted	0.02/0.02			

(2) Elements consist of atoms containing the same number of protons. (KS3_science)

The science discipline was a statistically significant positive predictor of extensiveness in M2, as shown in Table 5. This means that science PowerPoint presentations contained M2 to a greater extent than English PowerPoint presentations. Post-hoc comparisons demonstrated that science presentations overall included M2 significantly more extensively than mathematics presentations ($t = 4.71$, $p < .0001$) with a large effect size ($d = 0.78$). There was no significant difference between English and mathematics presentations in terms of extensiveness of M2 ($t = 1.39$, $p = .349$, $d = 0.23$). These findings indicate higher disciplinary informational demands in science PowerPoint presentations, which may pose challenges for students in both primary and secondary schools. This aligns with previous research suggesting that school science texts are characterised by specialised vocabulary and noun phrases that package information, "creating higher-order abstraction[s] and making them difficult to comprehend" (Fang, 2012, p. 25). Although KS3 was a negative predictor in this model, this was not statistically significant, suggesting that there was an overall tendency for KS3

Table 5
The results of the mixed-effects model for M2.

	Parameter	Estimates and 95% CI	*SE*	*t*	*p*
Fixed effects					
	Intercept	38.31 [30.47, 46.15]	3.98	9.63	< 0.001
	KS [3]	−8.86 [-18.22, 0.50]	4.75	−1.87	0.063
	discipline [mathematics]	−5.59 [-13.37, 2.20]	3.95	−1.41	0.159
	discipline [science]	13.31 [5.25, 21.36]	4.09	3.26	0.001
Random effects					
	SD of by-school random intercepts	4.58 [0, 8.96]			
Marginal R^2/Conditional R^2	0.12/0.15				

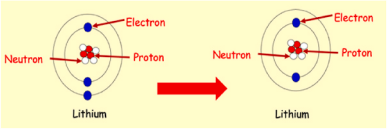
presentations to include M2 to a lesser extent than KS2 presentations, albeit not significantly. In addition to these fixed effects, there was also variation across schools in terms of extensiveness of M2 in the PowerPoint presentations.

This move was most represented by the step 'describing or elaborating on the subject content' (M2S2, see Example 2). This was followed by 'defining vocabulary' (M2S1), 'providing examples' (M2S6) and 'presenting terms or processes with a multimodal or visual resource' (M2S7), all of which were more common in KS3 presentations than in KS2 presentations. However, it should be noted that the occurrence of M2S6 was not distinctive enough for any combination of key stage and discipline because it was close to the centroid in the correspondence plot (Fig. 2). On the other hand, the students encountered a greater range of term definitions and multimodal depictions of concepts/terms at KS3 than KS2 although normalised extensiveness of this move in tokens showed a slight decrease at KS3. This suggests that although textual descriptions became less extensive, the comprehension demands at both linguistic and multimodal levels were likely to increase for secondary school students in PowerPoint presentations because the disciplinary content was delivered through fewer tokens in more concise style and multimodally, which would require understanding of discipline-specific vocabulary and multimodal literacy on the part of students. This was particularly pronounced for KS3 mathematics and science presentations since the steps M2S1 and M2S7 were associated with KS3 science and mathematics presentations (see Fig. 2). As can be seen in Example 3, understanding the concise definition of the term 'base' in a KS3 presentation requires knowledge of another term 'acid'.

(3) A base is the chemical opposite of an acid. (KS3_science)

Example 4 shows a multimodal resource coded as M2S7 in a KS3 science presentation. Although this resource has terms as labels, there is no written elaboration on these on the slide; hence, this step would demand students' multimodal literacy skills to understand the terms and processes.

(4)



KS3_science.

A less common step that occurred in 34% of all the presentations was 'communicating reasoning or justification' (M2S5) whose range was stable across the key stages. However, it was associated with mathematics and science rather than English (see Fig. 2). Example 5 shows an example of how communicating reasoning and justification was instantiated explicitly, using 'if … then' and 'therefore'.

(5) If we divide this amount into 10 equal parts then each part is 1/10 of 100% which is equivalent to 10%. Therefore, to find 10% of an amount we divide the amount by 10. (KS3_mathematics)

M3. Promoting teacher-student interaction and M4. Guiding student-student interaction are moves that intend to facilitate interaction and ask for contributions from students. Because M4 occurred only in 32% of all the presentations and steps within M4 were mostly the same as those of M3, apart from being explicitly pair or group work, we focus on M3 in this section. M3 was the second most extensive move in the overall corpus and became the most extensive in KS3 presentations. This move functions as establishing communication between the teacher and students, mostly through questions and tasks that seek students' responses. As Example 6 indicates, students were expected to answer the question to rounding, through the step 'seeking factual information' (M3S1).

(6) What would the following numbers be if rounded to the nearest whole number?
0.78

4.8
99.89 (KS2_mathematics)

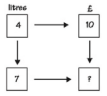
The results of the mixed-effects model for M3 indicated that the discipline of mathematics was a statistically significant positive predictor of extensiveness of M3 (see Table 6). This means that mathematics presentations overall contained M3 statistically more extensively than English presentations, irrespective of key stages. In addition, the discipline of science was a statistically significant negative predictor of extensiveness of M3, indicating that science presentations included M3 statistically less extensively than English presentations, irrespective of key stages. The post-hoc comparisons showed that mathematics presentations were significantly more extensive in terms of M3 than science presentations ($t = 6.82, p < .001$) with a very large effect size ($d = 1.14$). There was also variation across the schools in the extensiveness of this move. The variable 'key stage' was dropped from the model as it had no influence on the model fit.

The most dominant step within this move was 'seeking factual information' (M3S1), which was associated with KS2 mathematics, KS2 science and KS3 mathematics presentations. The second most common step was 'encouraging reasoning or justification' (M3S3) whose range remained largely stable, although there was a slight increase in KS3 presentations. This step was close to centroid in the correspondence plot (see Fig. 2), which points to a fairly similar occurrence across the combinations of key stages and disciplines. Example 7 is a representative instantiation of this move through the explicit employment of interrogative 'why'.

(7) Why does Beowulf matter to us? (KS3_English)

Less widespread steps of this move were 'seeking ideas or opinions' (M3S4) and 'encouraging multimodal or visual interpretation' (M3S5), both of which increased their presence in KS3 presentations in comparison to KS2 presentations. While M3S4 showed an association with KS3 English presentations, M3S5 was associated with KS3 mathematics and KS3 science presentations. These two steps require high-level cognitive skills, such as reflection and interpretation, on the part of students. Example 8 is an instance of M3S4 in which students were expected to brainstorm skills needed in an interview as a response to an open-ended question. Example 9 (M3S5) required students to understand the multimodal resource first to find out the problem and identify the multipliers.

(8) What skills do you think are needed in an interview? (KS3_English)
(9) Look at this diagram. State the problem in your own words. Work out the multipliers. (KS3_mathematics)



KS3_mathematics.

The other steps within M3 that occurred in between 10% and 19% of all the presentations in the whole corpus (see Fig. 1) were much less common than the abovementioned ones; therefore, we do not focus on them.

M5. Organising other activities function to instruct students in engaging with independent receptive tasks, such as reading and listening or hands-on activities, including experiments as well productive tasks, including independent writing or multimodal production. We also included the two steps that organise discourse, namely 'building intra- and inter-lesson connections' (M5S3) and 'motivating students' (M5S4) in this move but these steps remained overall rare although there was an increase in KS3 presentations. M5 mainly served as facilitating students' independent construction, mostly through its most common step 'encouraging writing or multimodal production in an individual task' (M5S2). Example 10 provides an instance of M5S2 by giving students instructions to create an advert, which may be a written or potentially multimodal output. M5S2 was expectedly most strongly associated with KS3 English presentations, as seen in Fig. 2. It was also associated with KS3 science presentations.

(10) Task
Create an advert for your ultimate goal job! (KS3_English)

Table 6
The results of the mixed-effects model for M3.

	Parameter	Estimates and 95% CI	*SE*	*t*	*p*
Fixed effects					
	Intercept	30.10 [23.34, 36.85]	3.43	8.78	< 0.001
	discipline [mathematics]	14.72 [7.98, 21.45]	3.42	4.30	< 0.001
	discipline [science]	−8.43 [-15.44, −1.41]	3.56	−2.37	0.019
Random effects					
	SD of by-school random intercepts	7.08 [3.39, 12.6]			
Marginal R^2/Conditional R^2	0.17/0.26				

The results of the mixed-effects model for M5, as summarised in Table 7, show that KS3 was a statistically significant positive predictor of the model, meaning that KS3 English presentations included M5 more extensively than KS2 English presentations. The negative interaction between KS3 and the disciplines of mathematics and science suggests that these two disciplines were affected differently at KS3 than the discipline of English even though those interactions were not statistically significant. The post-hoc comparisons indicated that there was no significant difference between KS2 and KS3 science presentations ($t = 0.98$, $p = .346$, $d = 0.31$) as well as between KS2 and KS3 mathematics presentations ($t = 1.16$, $p = .267$, $d = 0.34$) in terms of the extensiveness of M5 although the extensiveness of this move increased at KS3. The model also revealed random variation across the schools.

The second most common step with this move was 'providing instructions on receptive skills or hands-on activities' (M5S1). As can be seen in Example 11, students were asked to read information on the variables that they worked on during the previous lesson. Apart from these two steps, the other steps within M5 occurred rarely in our corpus; hence, we do not focus on them.

(11) Task –
Go back to your 'first practical worksheet' from last lesson.
Read over what your independent and dependent variables were. (KS3_Science)

M6. Assessing students' learning acts as evaluating students' learning, providing students instructions on formative (homework) or summative assessment and engaging students with self or peer assessment. Example 12 illustrates an instance of the step 'encouraging students to engage in self or peer assessment' (M6S4), which was the second most common step within this move. In this example, students were provided advice on what to assess and how to do peer assessment. M6S4 showed an association with KS3 English presentations (see Fig. 2), and students were asked to provide feedback on peer's written or multimodal production.

(12) Peer-assessment/critique
Swap books with a partner. What advice can you give them about their blog?
Remember to be both positive and constructive in your feedback to them. (KS3_English)

The regression model for the extensiveness of M6 revealed that KS3 was a statistically significant positive predictor, as shown in Table 8. This indicates that KS3 presentations overall included M6 more extensively than KS2 presentations. No other variable influenced the model fit, but the effect size remained weak.

The most common step within this move was 'providing feedback or answers to assessment or quizzes' (M6S3), which showed an association with KS3 mathematics presentations. As shown in Example 13, this step often functioned to give students answers to the quizzes or formative assessment that they were asked to complete on the previous slides. Such answers were provided without any descriptions or explanations on the slides. Except for these two steps, the other steps within this move, such as 'providing instructions on homework' remained uncommon in our corpus.

(13) Answers
a) 13 km/l
b) 6 L

5. Discussion

This section discusses the key findings and variations of moves/steps across the school stages and disciplines in the PowerPoint presentations. Since there is no other rhetorical move analysis of PowerPoint presentations and their disciplinary variation in school settings, we will discuss our findings in relation to relevant studies from other contexts, including higher education. The three most extensive moves in this study (M1, M2, M3) show some similarities with those of previous studies on instructional genres in higher education (Feng, 2021; Lee, 2016). Lee (2016, p. 105), for instance, found that the move 'setting up activity framework', which has some similarities with M3 in this study, occurred in all the EAP lessons (n = 24) at a US university. Similarly, 'definition' and

Table 7
The results of the mixed-effects model for M5.

	Parameter	Estimates and 95% CI	*SE*	*t*	*p*
Fixed effects					
	Intercept	5.89 [2.06, 9.72]	1.94	3.03	0.003
	KS [3]	8.04 [2.47, 13.61]	2.83	2.84	0.005
	discipline [mathematics]	−2.59 [-7.10, 1.92]	2.29	−1.13	0.260
	discipline [science]	0.25 [-4.19, 4.69]	2.25	0.11	0.913
	KS [3] × discipline [mathematics]	−4.63 [-11.07, 1.81]	3.27	−1.42	0.158
	KS [3] × discipline [science]	−4.94 [-11.67, 1.79]	3.42	−1.45	0.149
Random effects					
	SD of by-school random intercepts	2.27 [0, 4.09]			
Marginal R^2/Conditional R^2	0.10/0.14				

Table 8
The results of the regression model for M6.

Predictors	Estimates and 95% CI	*SE*	*t*	*p*
Intercept	4.88 [2.71, 7.06]	1.10	4.43	< 0.001
KS [3]	4.51 [1.43, 7.58]	1.56	2.89	0.004
R^2/R^2 adjusted	0.03/0.03			

'explanation' were present in all the 33 PowerPoint presentations examined in Feng's (2021) study on linguistics lectures at a Chinese university. However, the move 'introducing the context' was much more common in our corpus than in these two studies. This move likely underlies social practices of pre-tertiary settings or needs of school students, as Christie (2002, p. 162) notes that regulative discourse is crucial to "bringing the classroom text into being, and determining the [goals], directions … of activity" in primary and secondary classroom talk.

The extensiveness of the move 'introducing the context' was greater in KS2 presentations than in KS3 presentations. Although regulative discourse pertinent to managing student behaviour could decrease over the school years, Christie (2002, p. 173) notes that "a successful instance of a classroom discourse will be one in which the regulative register [discourse] appropriates the instructional" discourse. The lower presence of regulative discourse on KS3 slides points to a potential challenge for secondary school students who would be primed to see the learning objectives or the headline at the beginning of the lesson when they were at the primary school, increasing comprehension demands for students. Similarly, the more extensive focus on the move 'assessing students' learning' in KS3 presentations and the steps that involved individual receptive and productive tasks (as part of M5) in KS3 English presentations suggest that 'independent construction' (Martin & Rose, 2005; Rothery, 1994) and/or 'curriculum closure' (Christie, 2002) involving independent student work were valued more in KS3 presentations than in KS2 presentations. These likely increase both cognitive and potential language demands of KS3 presentations, indicating a shift from teacher-led discourse to independent student work (writing or multimodal production).

Notably, the KS3 science and KS3 mathematics presentations share the same dimensional space in the correspondence plot, highlighting their similar rhetorical features at KS3. They share distinctive rhetorical structures, including 'presenting terms or processes with a multimodal or visual resource' and 'encouraging multimodal or visual interpretation', which are rare at KS2. The multimodal nature of school science and mathematics has been researched mostly cross-sectionally from a SFL perspective (e.g. Fang, 2012; O'Halloran, 2015; Wilkinson, 2019). Based on the differences between KS2 and KS3 in this study, we argue that potential challenges at the school transition may not be just at the levels of written or spoken text but also at the levels of multimodal meaning-making. As He and Forey (2018) argued, we should not assume that every student has the multimodal literacy to unpack the meaning relations between semiotic resources on the slides. Multimodal resources would not necessarily make comprehension easier for students (e.g. Bartsch & Cobern, 2003).

The PowerPoint presentations in science were likely to include the move 'breaking down disciplinary content' more extensively than the disciplines of English and mathematics. This is partly attributable to a high frequency of academic words and technical vocabulary in school science (e.g., Fang, 2012; Green, 2019) that may require more definitions and elaborations. On the other hand, the greater extensiveness of the move 'promoting teacher-student interaction' in the mathematics presentations than in English or science presentations can be explained by the learning processes of mathematics which involve students' active participation, sharing answers and reasoning with the rest of the class or a teacher (Wilkinson, 2019).

Strikingly, the step 'seeking factual information' was the most common across the key stages, and this was even more pronounced at KS3. Although we acknowledge its importance for learning, its extensive representation at the expense of other steps within M3 may function to valorise constrained informational interaction given "the message of economy" on slides and its potential influence on students (Adams, 2006, p. 399). Nevertheless, KS3 presentations were more diverse in promoting teacher-student interaction than those of KS2 as the other steps apart from 'seeking factual information' became more common, increasing comprehension and interactional demands for students (Deignan et al., 2023). We refrain from overemphasising rare steps in PowerPoint presentations as we use a corpus-based approach and have space limitations. However, the rarity of several steps, such as 'presenting the subject content through analogy' and 'building on students' life experiences outside of school' is attributable to the social practices of semiotic technologies, including PowerPoint. Such semiotic technologies may value precise factual disciplinary content and interaction over bridging knowledge between disciplinary information and everyday knowledge of students (see Zhao et al., 2014 for a discussion in corporate and higher education settings).

Our empirical findings suggest that a typical model or TLC of a lesson presentation at KS2 in the disciplines of English, mathematics and science consists of three main phases that are 'curriculum initiation'/'setting the context' and 'curriculum elaboration'/'modelling' and 'curriculum negotiation'/'joint construction' between teachers and students that corresponded to M1, M2 and M3. The TLC of a lesson presentation at KS3 includes an additional phase of 'curriculum closure' or 'independent construction' besides the above-mentioned three phases. At least on the slides, 'independent construction' was not typical of KS2 presentations since no step that required student independent work occurred in more than 50% of the presentations. Distinct from classroom talk (e.g. Christie, 2002), PowerPoint presentations tend to privilege factual disciplinary content involving definitions, factual elaborations, and exemplifications (categorised as 'curriculum elaboration' here), especially at KS2 (see Table 3), over 'curriculum collaboration'/'joint construction' between students or 'curriculum closure'/'independent construction' (Martin & Rose, 2005; Rothery, 1994) on the slides.

6. Conclusion

This study was the first of its kind to research rhetorical moves across both disciplines and school stages in an underexplored genre of 240 PowerPoint presentations in pre-tertiary settings. This representative sample was selected in a principled way, utilising corpus software ProtAnt, from a larger corpus of school language. One of the key findings is that secondary school presentations overall become more multifunctional, containing a wider range of moves, while including the move 'introducing the context' less extensively, increasing comprehension demands on students. Based on the findings, we argue that students may face challenges in school language not just at the discourse level but also at the levels of multimodal meaning-making or understanding, particularly prevalent in secondary school science and mathematics PowerPoint presentations.

This study has three main contributions to Swalesian genre analysis and research on PowerPoint presentations. First, we showed the importance of considering both extensiveness and range of moves/steps. Given that a move/step that occurs in most texts is not necessarily the most extensive, reporting only one of these would provide an incomplete picture of the rhetorical structure. Second, we analysed both written and visual resources in PowerPoint presentations when the visual resources contributed to the informational content. This allowed us to identify multisemiotic steps, such as 'presenting terms or processes with a multimodal or visual resource', which would otherwise not have been possible by analysing the written text only. Such multisemiotic steps play an important role in distinguishing the discourse of disciplines and school stages (primary-secondary), as Fig. 2 shows. Our third contribution is our data-driven rhetorical framework of the PowerPoint presentations in school settings (Table 2). This framework can be used as a foundation for further research on PowerPoint presentations prepared using semiotic technologies in pre-tertiary settings and beyond in other contexts.

Several limitations to this study should be acknowledged. This study coded the visual resources only when they contributed to the informational content of the PowerPoint presentations. Other visual resources, such as emojis or depictions of cartoon characters that might have interpersonal functions or decorative purposes, are beyond the scope of this study. Although the number of presentations we analysed is greater than the relevant previous studies reviewed, a larger sample size would allow researchers to investigate other disciplines and factors, such as teachers' experience and knowledge of semiotic technologies. Lastly, the unavailability of classroom audio or video recordings corresponding to these presentations prevented us from analysing these modes together. Future research is necessary to examine PowerPoint presentations across disciplines and school stages by analysing different modes and complementing this analysis with teacher interviews and classroom observations.

Our empirical findings suggest important pedagogical implications for schools, teachers and teacher trainers. Our rhetorical framework for the PowerPoint presentations can be used for pre-service teachers and teacher trainers for training purposes to widen the discursive repertoire of teachers in both primary and secondary school settings in England and other countries. Teacher trainers can present the moves/steps and their descriptors to potential teachers to help them structure their PowerPoint presentations and practise these common ways of meaning-making. It may be beneficial for teachers to introduce the moves/steps identified in this study to students to scaffold their learning, especially at secondary schools so that students can use them for note-taking purposes and segment their learning into chunks to ease comprehension. It would also be helpful for secondary school teachers to gain insights into the meaning-making patterns that we identified in primary school settings and vice versa. This cross-learning may help to ease the potential challenges of students at the transition. Secondary school teachers, for example, might include the move 'introducing the learning context' in their PowerPoint presentations more commonly. In this case, students may feel at ease and more oriented towards learning because this would be in line with their earlier learning practices. Similarly, primary school teachers may include the move 'assessing students' learning' or 'organising other activities' in their PowerPoint presentations more commonly to prepare students for their future learning in secondary schools. Our rhetorical framework can serve as guides for teachers to design their PowerPoint presentations in accordance with their student profiles and learning needs in school settings.

CRediT authorship contribution statement

Duygu Candarli: Writing – original draft, Visualization, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Alice Deignan:** Writing – review & editing, Resources, Project administration, Methodology, Funding acquisition, Conceptualization.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jeap.2025.101532.

References

Adams, C. (2006). PowerPoint, habits of mind, and classroom culture. *Journal of Curriculum Studies, 38*(4), 389–411. https://doi.org/10.1080/00220270600579141

Anthony, L., & Baker, P. (2015). ProtAnt: A tool for analysing the prototypicality of texts. *International Journal of Corpus Linguistics, 20*(3), 273–292. https://doi.org/10.1075/ijcl.20.3.01ant

Bartsch, R. A., & Cobern, K. M. (2003). Effectiveness of PowerPoint presentations in lectures. *Computers and Education, 41*(1), 77–86. https://doi.org/10.1016/S0360-1315(03)00027-7

Bates, D. M., Mächler, M., Bolker, B. M., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software, 67*(1), 1–48. https://doi.org/10.18637/jss.v067.i01

Biber, D., Connor, U., & Upton, T. A. (2007). *Discourse on the move: Using corpus analysis to describe discourse structure*. John Benjamins.

Brezina, V. (2018). *Statistics in corpus linguistics: A practical guide*. Cambridge University Press.

Christie, F. (2002). *Classroom discourse analysis* (Continuum).

Cotos, E., Huffman, S., & Link, S. (2017). A move/step model for methods sections: Demonstrating rigour and credibility. *English for Specific Purposes, 46*, 90–106. https://doi.org/10.1016/j.esp.2017.01.001

Deignan, A., Candarli, D., & Oxley, F. (2023). *The linguistic challenge of the transition to secondary school: A corpus study of academic language. Routledge*. https://doi.org/10.4324/9781003081890.

DfE. (2024). Schools, pupils and their characteristics: Academic year 2023/24. https://explore-education-statistics.service.gov.uk/find-statistics/school-pupils-and-their-characteristics.

Dilnot, C. (2016). How does the choice of A-level subjects vary with students' socio-economic status in English state schools? *British Educational Research Journal, 42*(6), 1081–1106. https://doi.org/10.1002/berj.3250

Fang, Z. (2012). Language correlates of disciplinary literacy. *Topics in Language Disorders, 32*(1), 19–34. https://doi.org/10.1097/TLD.0b013e31824501de

Fang, Z., Schleppegrell, M. J., & Cox, B. E. (2006). Understanding the language demands of schooling: Nouns in academic registers. *Journal of Literacy Research, 38*(3), 247–273. https://doi.org/10.1207/s15548430jlr3803_1

Feng, D. (2021). Genre, pedagogy, and PowerPoint design. A multimodal move analysis of linguistics lecture slides. In K. L. Lin, I. N. Mwinlaaru, & D. Tay (Eds.), *Approaches to specialized genres* (pp. 177–197). Routledge.

Green, C. (2019). A multilevel description of textbook linguistic complexity across disciplines: Leveraging NLP to support disciplinary literacy. *Linguistics and Education, 53*, Article 100748. https://doi.org/10.1016/j.linged.2019.100748

Greenacre, M. (2017). *Correspondence analysis in practice* (3rd ed.). Chapman & Hall/CRC.

Greene, J. W., & Coxhead, A. (2015). *Academic vocabulary for middle school students: Research-based lists and strategies for key content areas*. Brookes Publishing.

Halliday, M. A. K. (1978). *Language as social semiotic: The social interpretation of language and meaning*. Arnold.

He, Q., & Forey, G. (2018). Meaning-making in a secondary science classroom: A systemic functional multimodal discourse analysis. In K.-S. Tang, & K. Danielsson (Eds.), *Global developments in literacy research for science education* (pp. 183–202). Springer.

Hu, G., & Liu, Y. (2018). Three minute thesis presentations as an academic genre: A cross-disciplinary study of genre moves. *Journal of English for Academic Purposes, 35*, 16–30. https://doi.org/10.1016/j.jeap.2018.06.004

Jindal-Snape, D., Hannah, E. F., Cantali, D., Barlow, W., & MacGillivray, S. (2020). Systematic literature review of primary–secondary transitions: International research. *The Review of Education, 8*(2), 526–566. https://doi.org/10.1002/rev3.3197

Kanoksilapatham, B. (2005). Rhetorical structure of biochemistry research articles. *English for Specific Purposes, 24*(3), 269–292. https://doi.org/10.1016/j.esp.2004.08.003

Lee, J. J. (2016). "There's intentionality behind it…": A genre analysis of EAP classroom lessons. *Journal of English for Academic Purposes, 23*, 99–112. https://doi.org/10.1016/j.jeap.2015.12.007

Lim, J. M. H. (2006). Method sections of management research articles: A pedagogically motivated qualitative study. *English for Specific Purposes, 25*(3), 282–309. https://doi.org/10.1016/j.esp.2005.07.001

Lindenberg, D. (2023). Logico-semantic relations between spoken text and slides' visual elements in student presentations conducted online in the English as a Foreign Language context. *Visual Communication, 1–27*. https://doi.org/10.1177/14703572231180215

Liu, X., Xu, Y., & Pange, J. (2016). Teachers' use of PowerPoint in kindergarten: An empirical investigation in China. *Education and Information Technologies, 21*(2), 425–441. https://doi.org/10.1007/s10639-014-9330-z

Martin, J. R., & Rose, D. (2005). Designing literacy pedagogy: Scaffolding asymmetries. In R. Hasan, C. M. I. M. Matthiessen, & J. Webster (Eds.), *Continuing discourse on language* (pp. 251–280). Continuum.

Mežek, Š., & Swales, J. M. (2016). PhD defences and vivas. In K. Hyland, & P. Shaw (Eds.), *The Routledge handbook of English for academic purposes* (pp. 361–375). Routledge.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Sage.

Moreno, A. I., & Swales, J. M. (2018). Strengthening move analysis methodology towards bridging the function-form gap. *English for Specific Purposes, 50*, 40–63. https://doi.org/10.1016/j.esp.2017.11.006

Nenadić, O., & Greenacre, M. (2007). Correspondence analysis in R, with two- and three-dimensional graphics: The ca package. *Journal of Statistical Software, 20*(3), 1–13. https://doi.org/10.18637/jss.v020.i03

O'Halloran, K. L. (2015). The language of learning mathematics: A multimodal perspective. *The Journal of Mathematical Behavior, 40*, 63–74. https://doi.org/10.1016/j.jmathb.2014.09.002

QSR International. (2018). *NVivo* (version 12) [Computer software]. Melbourne, Australia www.Qsrinternational.com.

R Core Team. (2023). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org.

Rothery, J. (1994). *Exploring literacy in school English (write it right resources for literacy and learning)*. Metropolitan East Disadvantaged Schools Program.

Rowley-Jolivet, E. (2002). Visual discourse in scientific conference papers: A genre-based study. *English for Specific Purposes, 21*(1), 19–40. https://doi.org/10.1016/S0889-4906(00)00024-7

Schleppegrell, M. (2012). Academic language in teaching and learning. *The Elementary School Journal, 112*(3), 409–418. https://doi.org/10.1086/521238

Swales, J. (1990). *Genre analysis: English in academic and research settings*. Cambridge University Press.

Swales, J. M. (2004). *Research genres: Explorations and applications*. Cambridge University Press.

Wang, Y. A. (2023). Demystifying academic promotional genre: A rhetorical move-step analysis of teaching Philosophy statements (TPSs). *Journal of English for Academic Purposes, 65*, Article 101284. https://doi.org/10.1016/j.jeap.2023.101284

Wilkinson, L. C. (2019). Learning language and mathematics: A perspective from linguistics and education. *Linguistics and Education, 49*, 86–95. https://doi.org/10.1016/j.linged.2018.03.005

Yu, D., & Bondi, M. (2017). The generic structure of csr reports in Italian, Chinese, and English: A corpus-based analysis. *IEEE Transactions on Professional Communication, 60*(3), 273–291. https://doi.org/10.1109/TPC.2017.2702040

Zhao, S., Djonov, E., & Van Leeuwen, T. (2014). Semiotic technology and practice: A multimodal social semiotic approach to PowerPoint. *Text & Talk, 34*(3), 349–375. https://doi.org/10.1515/text-2014-0005

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