

Epistemic features of science teachers' talk: comparing the discursive practices of two science teachers

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Introduction and Aims

Current perspectives in science learning and instruction emphasise that students should not only be aware of 'what we know' but also of 'how we know what we know and why we choose to believe it over alternatives' (Duschl, 2008). Thus, science educators need to address the epistemic nature of the scientific practices and knowledge. This study argues that a way to foreground the epistemic aspects of science is to teach science as argument (Kuhn, 1993; Driver, Newton & Osborne, 2000). *Argumentation* is an integral part of the epistemic practices of science which promotes knowledge claims and their negotiation within the scientific community. Epistemic practices are 'specific ways members of a community propose, justify, evaluate, and legitimize knowledge claims' (Kelly, 2008). Through the use of argumentation to teach science, *epistemic discourse* can be developed and established in the science classroom. What is more, epistemic discourse can help students improve their epistemological understanding (Sandoval & Morrison, 2003). Yet, there is little research to support this claim. The purpose of this study was to identify the epistemic features of science teachers' classroom talk in argumentation lessons as to determine how epistemic discourse is enacted during argumentation-based instruction and secondly, to compare this discourse with the patterns of discourse produced in non-argumentation lessons.

Study Design and Methods

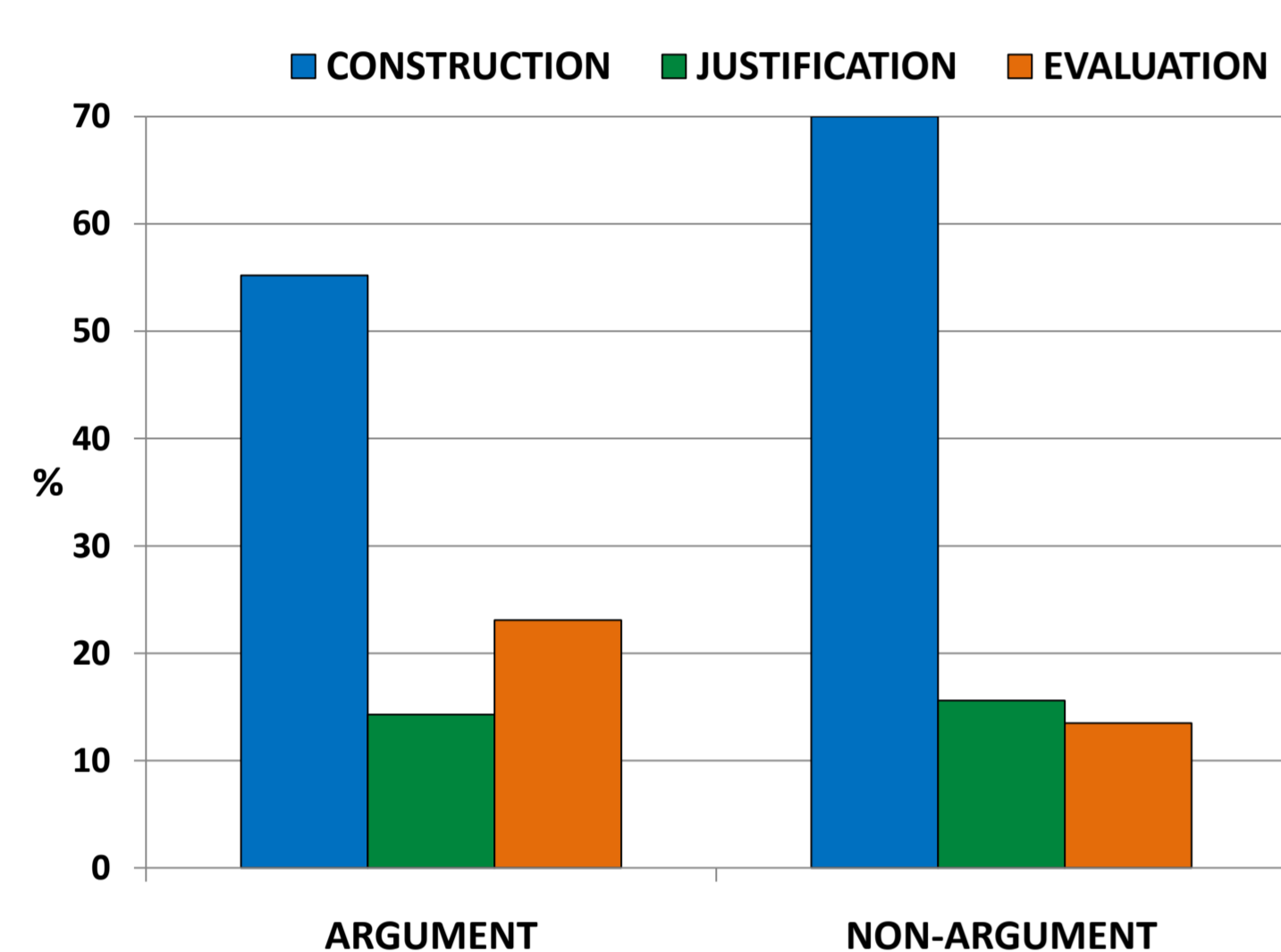
- *Qualitative Case study* design to explore 'a contemporary phenomenon within its real-life context' where 'the boundaries between phenomenon and context are not clearly evident' (Yin, 2003).
- Video-recorded classroom observations of 2 teachers and their students. Both argumentation and non-argumentation lessons were observed. The difference between an argumentation and a non-argumentation lesson was based on the description of the lesson given by the teacher.
- Semi-structured interviews of teachers at the beginning and end of the study

Analysis

- Thematic analysis was based on a framework of **epistemic operations** as describing, explaining, exemplifying, arguing, counter-arguing etc. (Jiménez-Aleixandre et al., 2008; Ohlsson, 1996)
- The analysis showed two distinct ways in which the epistemic activities of the classroom discourse can be described:
 - the epistemic operations **performed** by the teacher
 - The epistemic operations teachers **prompted** students to use

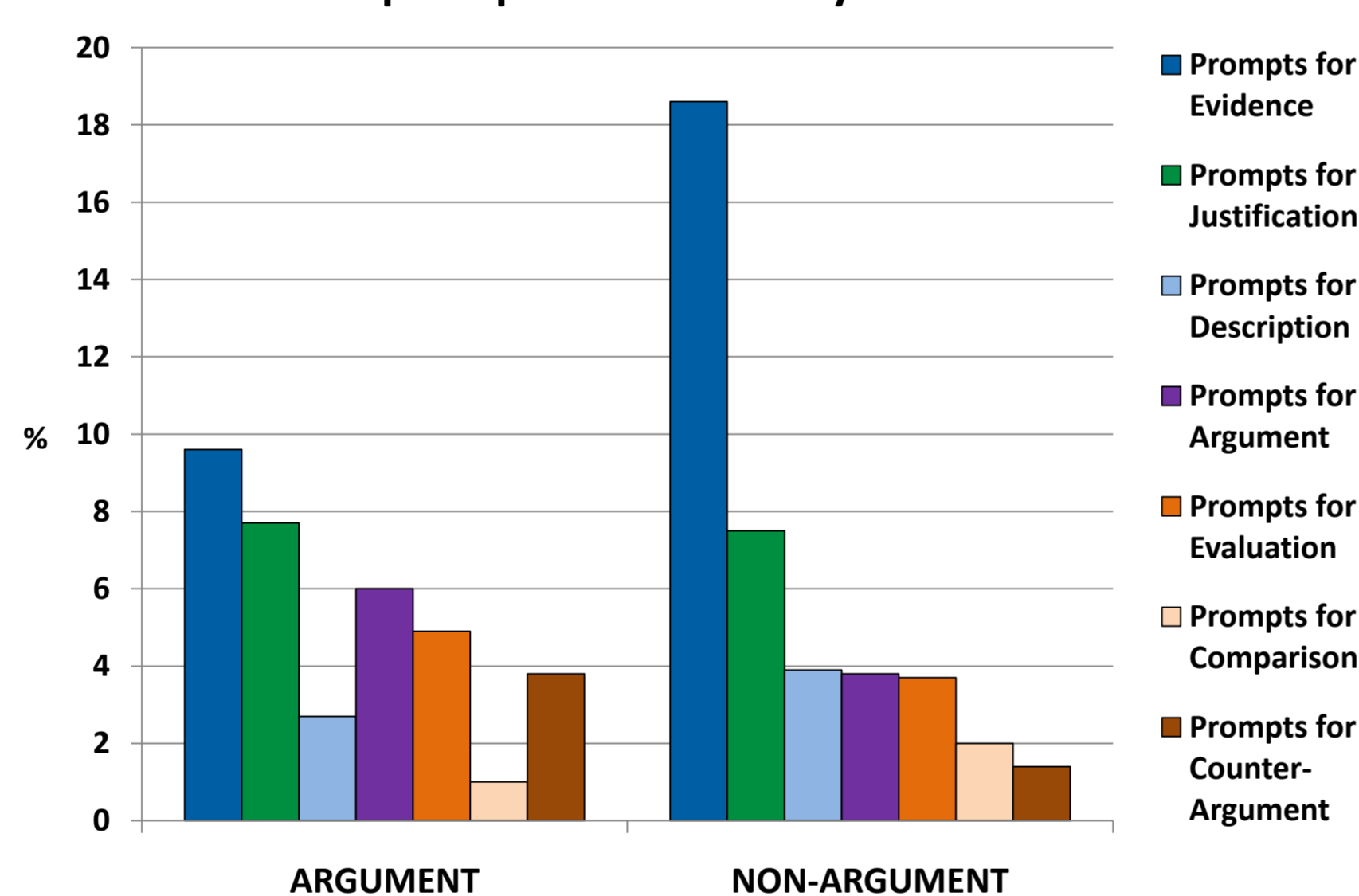
Case Study 1

- male teacher, early 40s
- 20 years teaching experience, leading role within his science department
- mixed comprehensive school in North-West London, Year 9 class (13-14 year olds)
- 13 lessons observed (6 argumentation, 3 practicals, 4 non-argumentation)



- Evaluation/critique present more in the teacher's talk during argumentation lessons
- Non-argumentation lessons characterised by construction with the teacher mainly using the epistemic operations of 'Provides Evidence/Information' or 'Prompts for Evidence/Information'

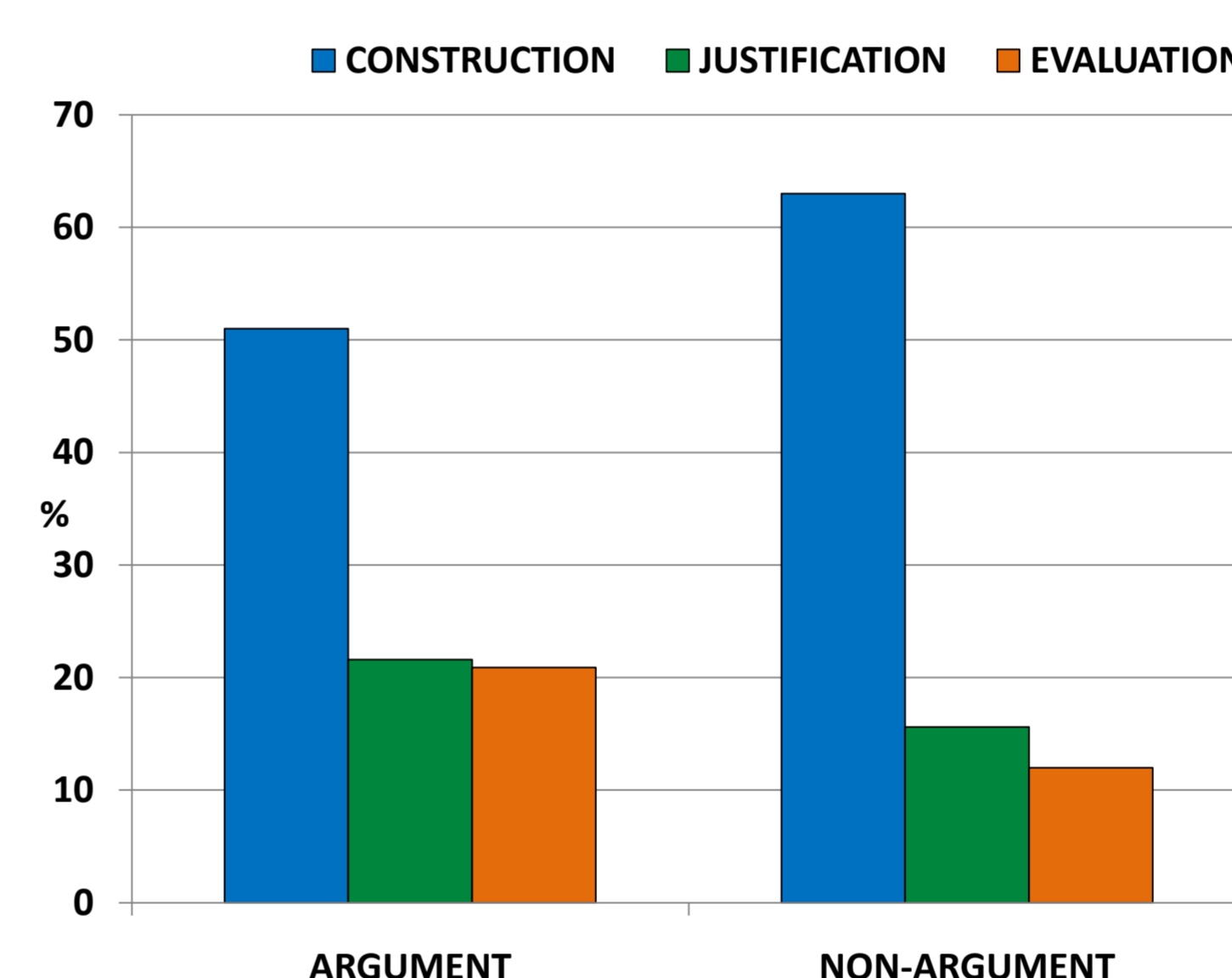
Teacher prompts in Case Study 1



- More Prompts for Argument, Evaluation and Counter-Argument in argumentation lessons
- 'Prompts for Justification' is similar in both types of lessons and throughout the school year.
- Teacher had a view of argumentation that emphasised justification and strongly relied on the notion of 'evidence' in his argumentation lessons

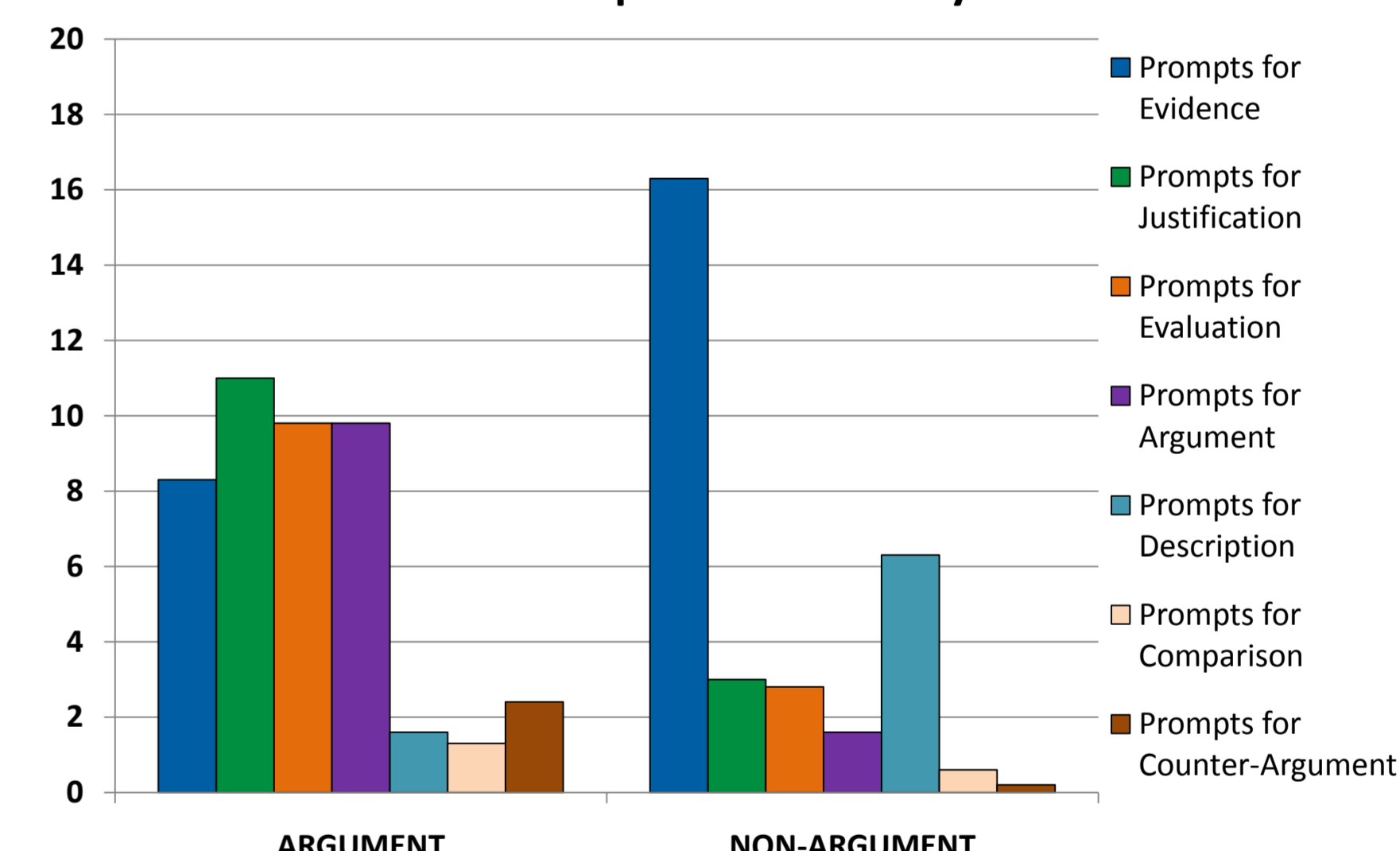
Case Study 2

- female teacher, late 20s
- 3 years teaching experience, Science Specialist coordinator
- mixed comprehensive school in North-East London, Year 10 class (14-15 year olds)
- 12 lessons observed (4 argumentation, 8 non-argumentation)



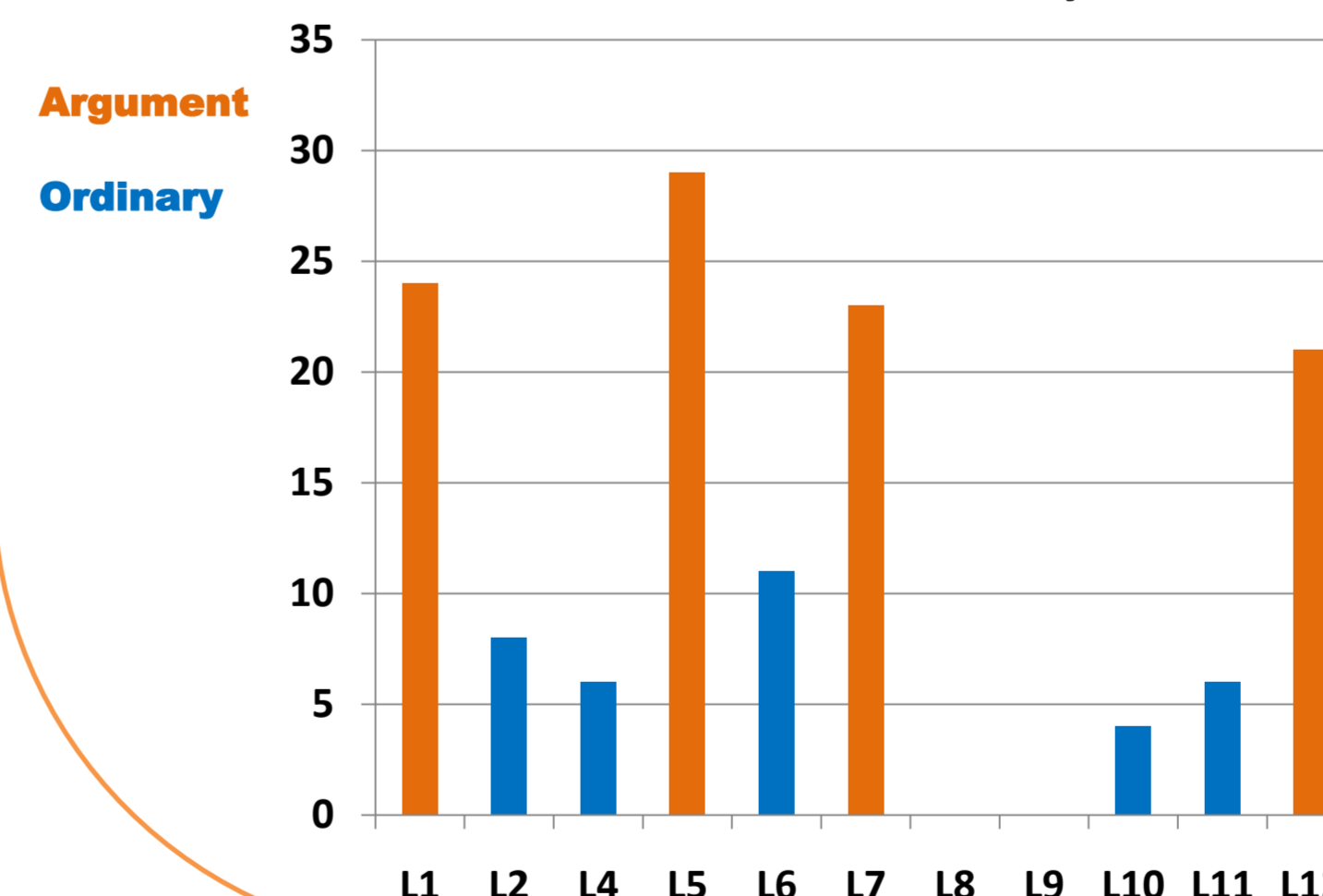
- Argumentation as end-of-unit lessons facilitated the use of evaluation/critique in this teacher's talk
- Development within argumentation lessons for the epistemic operations of 'Prompts for Justification' and 'Prompts for Evaluation' but not across the two types of lessons

Teacher Prompts in Case Study 2

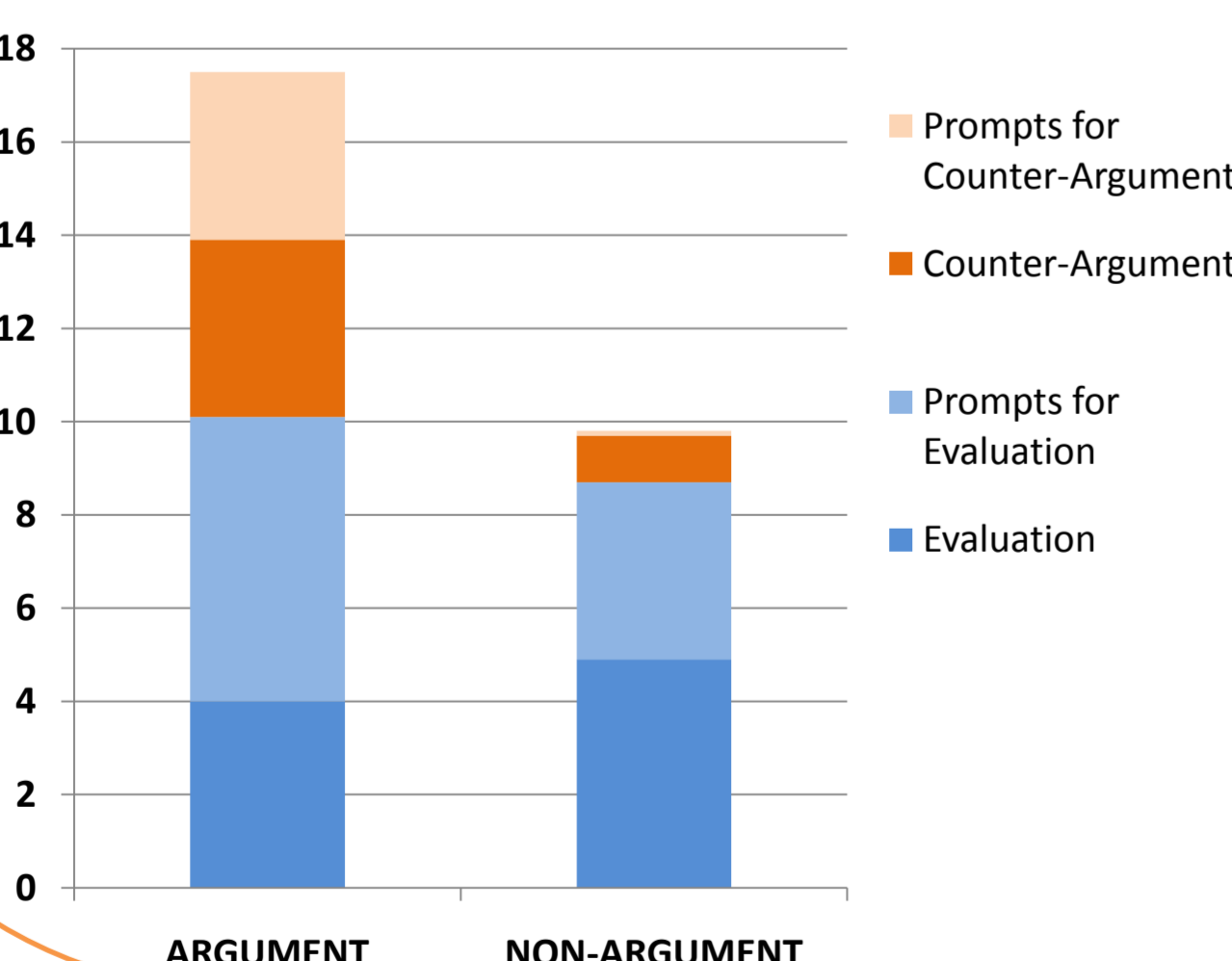


- The nature of classroom talk shifts towards *justification* and *evaluation* during argumentation lessons
- Non-argumentation lessons focus on retrieving content and low-level epistemic operations

Use of 'Why'



- Emphasised argumentation as an instructional approach based on dialogue, which led her to focus on instructional aspects of argumentation such as group-work and student ability
- Teaching argumentation a distinct approach to her everyday teaching practices



- Evaluative processes were mainly present through epistemic operations of 'Evaluation' and 'Prompts for Evaluation'
- In non-argumentation lessons, counter-argument was almost non-existent. No plurality of views or perspectives was presented to students.

Conclusions

- Argumentation as a frame work for science teaching enhanced the epistemic discourse initiated by the two teachers
- Teachers taught argumentation as a distinct approach to their everyday teaching practices and were influenced by their views of the nature of argumentation as a scientific process and/or an instructional approach.
- Epistemic practices of construction, justification and evaluation were present in argumentation lessons; in non-argumentation lessons classroom talk was dominated by providing evidence/ information, descriptive talk, and prompting students for low-level epistemic operations such as providing evidence, descriptions and predictions.
- Epistemic discourse was of a higher level as the teachers moved from construction, to justification, to evaluation and counter-argument. This developmental sequence could be utilised to structure classroom talk and help students engage in, and develop their use of, epistemic discourse.

References

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