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Using Language to Teach Science: Researching Classroom communication and Developing Dialogical Approaches

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Outline of the course

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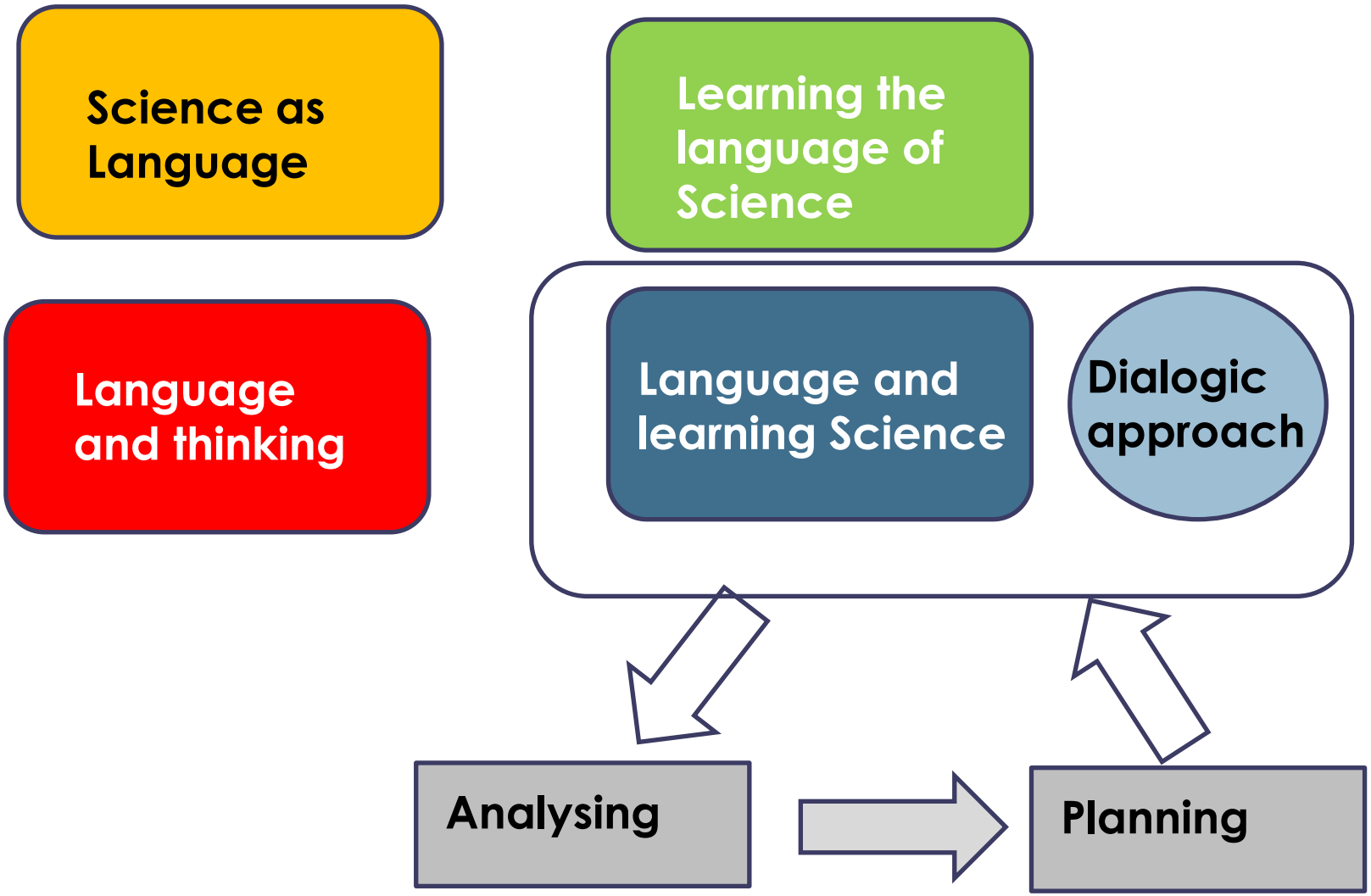

The roles of language in teaching and learning Science

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Language is a fundamental part of the activity of teaching and learning (to many the most important element).

Language plays four main roles in this activity:

a) It provides a lexico-grammatical realisation of the meaning being constructed
b) It provides a series of scientific genres
c) It shapes the interactions among participants (general)
d) It shapes the process of learning science

- **a and b** refer to **what** is being taught-learnt

- **c and d** refer to **how** it is being taught-learnt

A socio-cultural approach:
communicative approaches

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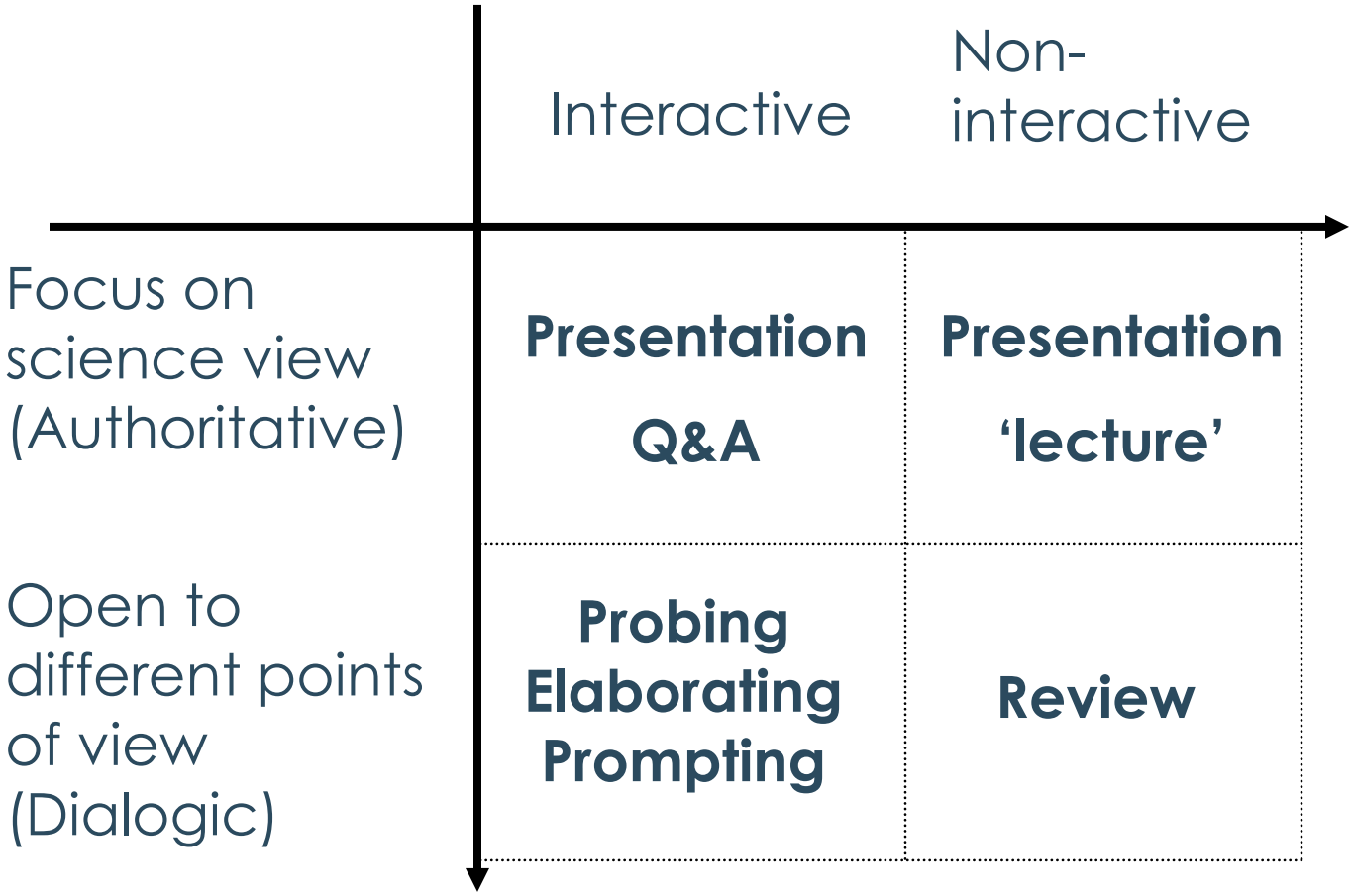

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To develop a way of analysing teacher-pupil interactions in science classrooms focussing on classroom talk.

To explore implications of this analysis for planning and implementing teaching

'Meaning making in Secondary Science Classrooms'

Eduardo Mortimer and Phil Scott

Open University Press, 2003

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Teacher: Do you remember the electric bell?

Students: Yes! [*in chorus*]

Teacher: OK! Did any of you notice, did any of you actually hold onto the bell after it had...been working? What did you notice?

Suzanne: Vibration

Teacher: Well, the arm vibrated, yes. Sound. What else did you notice?

Tom: It was loud.

Teacher: That's not quite what I'm getting at.

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Teacher: Remember the bell. There's the bell [*holding up a bell in front of the class*]. You did the experiment. If you held onto this bit here where the wires were [*indicating*], did you notice anything there?

Jason: There were sparks there.

Teacher: Heat, did you notice some heat?

Jason: There were sparks from there.

Teacher: There were?

Jason: Sparks.

Teacher: There were some sparks, yes. Let's just ignore the sparks a minute...some heat. There was a little bit of heat there with that one.

WORK WITH A PARTNER

- Read through the transcript
- Look at what the teacher says: how would you describe their role?
- Look at what the pupils say: how would you describe their role?

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Communicative approaches – Patterns of talk

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Teacher: Do you remember the electric bell? [INITIATION]
Students: Yes! [RESPONSE]
Teacher: OK! [EVALUATION]

Teacher: Did any of you actually hold onto the bell after it had...been working? What did you notice? [INITIATION]
Suzanne: Vibration [RESPONSE]
Teacher: Well, the arm vibrated, yes. Sound. [EVALUATION]

Teacher: What else did you notice? [INITIATION]
Tom: It was loud. [RESPONSE]
Teacher: That's not quite what I'm getting at [EVALUATION]

Language and Thinking
Communicative approaches – Patterns of talk

The **I-R-E** pattern

I stands for **initiation**: teacher asks a question

R stands for **response**: pupil responds

E stands for **evaluation**: teacher evaluates

This is a *very* common pattern of classroom talk…which occurs in patterns of 3 (or triads)

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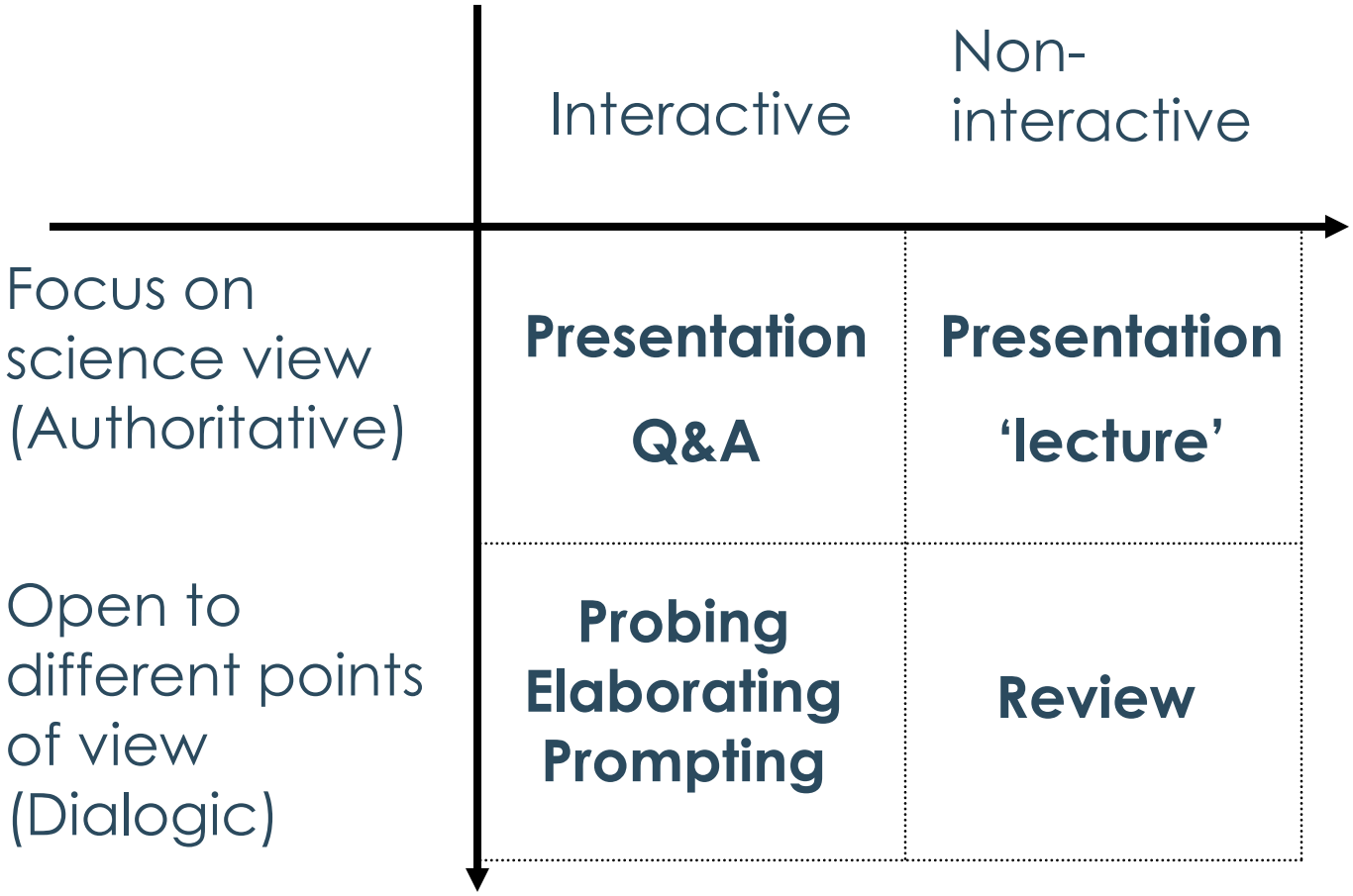

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1. **Teacher:** OK Jack, what happens to that carrot seed?
2. **Jack:** First it's a seed…
3. **Teacher:** It is. Shall we say it's in the ground?
4. **Jack:** Yeah it is. It needs water and a bit of sunshine.
5. **Teacher:** Yes. What happens?
6. **Jack:** It germinates.
7. **Teacher:** (Nods). What scientific words did Jack use?
8. **Hope:** Germination
9. **Teacher:** Good! (writes 'germination' on board) What happens next?
10. **Jack:** Stem starts growing

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11. **Teacher:** Ok. What else?
12. **Jack:** It starts growing more.
13. **Teacher:** Ok, it's growing. We have the roots and a stem (draws on board). What else? What's missing from the plant?
14. **Callum:** Don't know.
15. **Jack:** A carrot?
16. **Teacher:** Not yet. What's missing?
17. **Shannon:** A plant?
18. **Teacher:** We've already got the plant!
19. **Nathan:** A flower?
20. **Teacher:** Yes! A flower!

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Initiation: **Teacher:** OK Jack, what happens to that carrot seed?

Response: **Jack:** First it's a seed…

Evaluation: **Teacher:** It is.

Initiation: Shall we say it's in the ground?

Response: **Jack:** Yeah it is. It needs water and a bit of sunshine.

Evaluation: **Teacher:** Yes

Initiation: What happens?

Response: **Jack:** It germinates.

Evaluation: **Teacher:** (Nods).

Initiation: What scientific words did Jack use?

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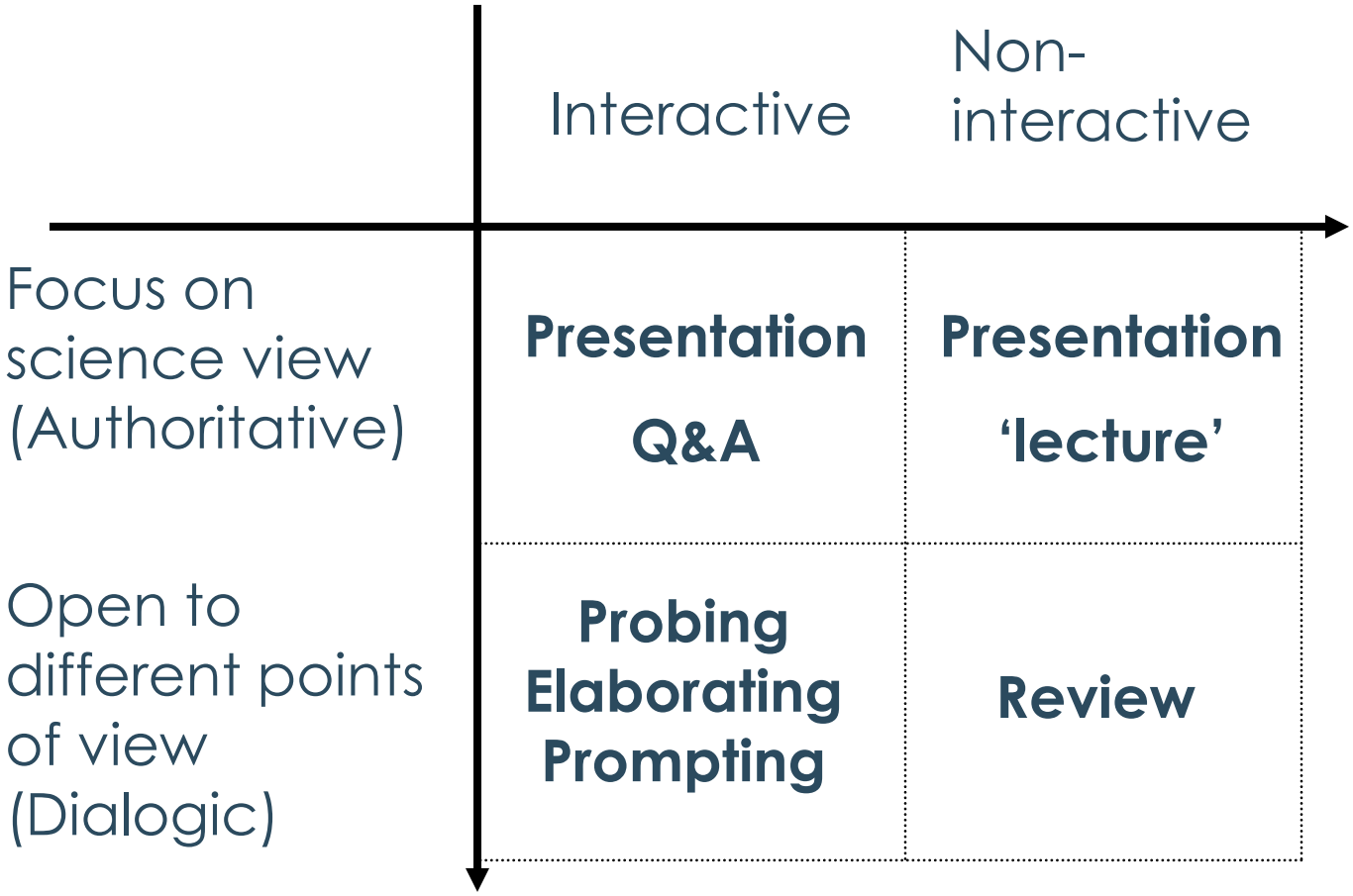

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PLACE IN CORRECT ORDER: starting with the smallest number

1.65 1.4 1.2

1.9 1.25

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Courtney orders the numbers:

1.2 1.4 1.9 1.25 1.65

….the computer screen flashes up 'incorrect'.

Teacher: Not quite right Courtney, although I can see why you chose this order. Can anyone see which numbers Courtney has mixed up?

Liam: I can! 1.9 should be the biggest!

Teacher: Who thinks Liam is right? Hands up if you agree *(a few children raise their hands).* So is there anyone who doesn't think he is right? Lewis what do you think?

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Lewis: 1.65 has to be the biggest because 65 is bigger than 9.

Liam: It doesn't even say 65 though!

Teacher: Hang on a minute Liam, see what Lewis thinks. So you think 1.65 is the biggest?

Lewis: Er, yes…because it looks the biggest number but…but it can't be right because it's (*the computer*) saying it's wrong.

Teacher: Ok, let's see who else has an idea. Courtney do you think you know now?

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Courtney: Yes…that 1.25 should go near 1.2 because…they both start with 1.2 so that means they are near each other.

Teacher: Do we agree? *(class shout YES!)* Can anyone explain it a bit better? David?

David: That 2 can have a 0 after it to make it like 20, so could the 4 and the 9. Then you can order them easily because you know it goes 20, then 25, then 40, then 65, then 90…and then you have all the numbers in the right order.

Teacher: That's a very interesting way of explaining it David. Let's see if he's right…

WORK WITH A PARTNER

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- Look at what the teacher says: how would you describe their role?
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The **I-R-P-R-P-R-P-** pattern

I stands for **initiation**: teacher asks a question

R stands for **response**: pupil responds

P stands for **prompt**: teacher prompts

This pattern of classroom discourse involves *chains* of interaction to develop a

dialogic communicative approach.

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What skills and knowledge does the teacher need to be able to promote this kind of DIALOGIC TALK in their classroom?

Make a list!

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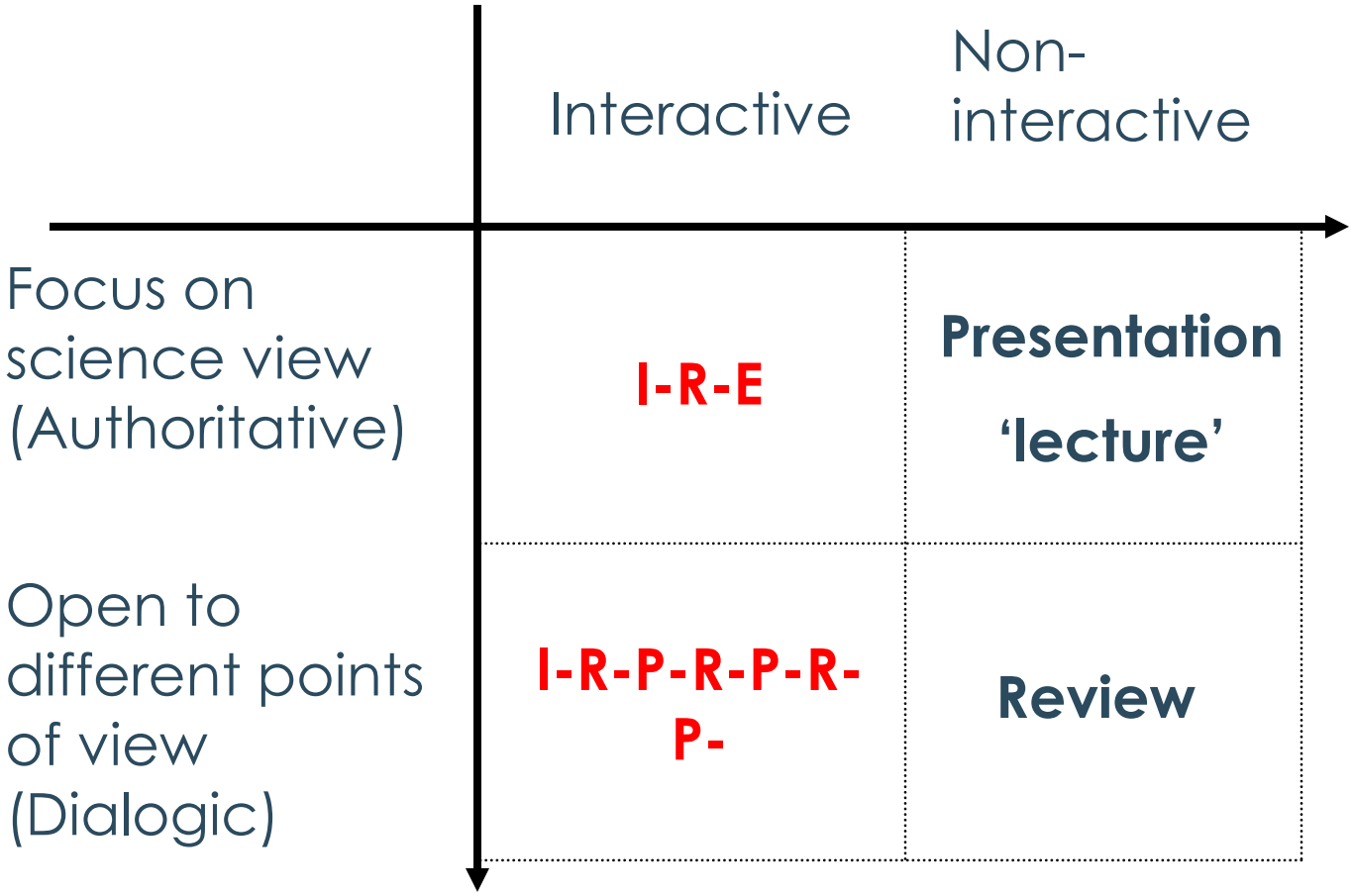

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dialogic exploration of everyday and scientific views

Requires resolution through…

demand…

authoritative guidance/statements by the teacher

…each approach contains the 'seed' of the other

Scott, Aguiar, Mortimer, 2006

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dialogic exploration of everyday and scientific views

Turning point

authoritative guidance/statements by the teacher

Scott and Ametller, 2007

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Negotiating ideas across two planes

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The social plane is the place where it makes sense to talk about discourse and communicative approaches.
From the point of view of Dialogic Education, the discourse follows a rhythm of opening and closing that corresponds to internalisation cycles (until IDEA' ≈ IDEA)

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The social plane is the place where it makes sense to talk about discourse and communicative approaches.
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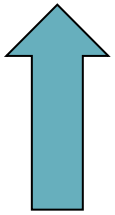
…*dialogic* exploration by students



demands…

…*authoritative* statements by the teacher

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…***dialogic*** exploration of everyday and scientific views

Requires resolution through…

…***authoritative*** guidance by the teacher

…each approach contains the 'seed' of the other

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So which COMMUNICATIVE APPROACH?? is the BEST?

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…depends on the purpose

Getting the idea across..

Pierre Milon / Sony Pictures Classics

Authoritative approach

Exploring pupils' ideas

Dialogic approach

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- All the communicative approaches are needed
- It is essental to have some opportunities for dialogue, but authoritative episodes are also required
- The quality of dialogue is more important than the time devoted to it (interanimation of ideas)
- Teachers know and use all communicative approaches but being counscious of them and planning when to use them makes a huge difference..