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Disciplinary Affordance vs Pedagogical Affordance: Teaching the Multimodal Discourse of University Science

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Overview

History of the term affordance

Disciplinary affordance

An example

Pedagogical affordance

An example

Conclusion
Discipline-based Education Research

“investigates learning and teaching in a discipline using a range of methods with deep grounding in the discipline’s priorities, worldview, knowledge and practices”.

Long-term goal: “to understand the nature of expertise in a discipline”.

US National Research Council (2012, p 9)
We can partly talk our way through a scientific event or problem in purely verbal conceptual terms, and then we can partly make sense of what is happening by combining our discourse with the drawing and interpretation of visual diagrams and graphs and other representations, and we can integrate both of these with mathematical formulas and algebraic derivations as well as quantitative calculations, and finally we can integrate all of these with actual experimental procedures and operations. In terms of which, on site and in the doing of the experiment, we can make sense directly through action and observation, later interpreted and represented in words, images, and formulas.

Lemke (1998:7)
Disciplinary meaning making

Interested in the relationship between knowledge and its representation.

Disciplinary meaning is distributed across a range of modes (Lemke 1998, Airey 2009; 2014)

Claim:

Physics forms a perfect playground for semioticians since disciplinary meaning is largely agreed and relatively fixed.
Disciplinary meaning is distributed across a range of modes (Lemke 1998, Airey 2009; 2014)

Interested in the relationship between knowledge and its representation.
Disciplinary meaning making

View this disciplinary meaning making in terms of disciplinary affordance

Background to the term affordance

Gibson (1979)
Interested in organism in the environment.

**Affordance is an invitation to action that is inherent in the environment**

Affordance is an inherent property of an object.

A single object has a myriad of affordances depending on the setting and the organism.
Background to the term affordance


Affordance is only that which is *perceived by the user*.

Affordance is only what a resource affords to one individual, *here and now*.

This means that *affordance changes* depending on the individual and setting.
Disciplinary affordance

 Introduced the term **disciplinary affordance** for semiotic resources.

Fredlund *et al.* (2012)
Disciplinary affordance

Definition:

The agreed meaning making functions that a semiotic resource fulfils for a particular disciplinary community.

Airey (2014)
Disciplinary affordance

Radical break with Gibson and Norman.

Focuses on the discipline’s collective, agreed interpretation of the resource rather than the individual learner’s experience.

Has potential for education research.
Disciplinary affordance

If each disciplinary-specific semiotic resource has a particular disciplinary affordance

Then

Disciplinary learning can be problematised in terms of coming to appreciate the disciplinary affordances of semiotic resources

Fredlund et al (2012:658)
Disciplinary affordance

The disciplinary affordance of a semiotic resource is shaped by its:

- Materiality
- Rationalization (carried out by the social group)
- Historical anomalies

Airey (2014); cf Mavers *Glossary of Multimodal Terms*
An example of a semiotic resource with high disciplinary affordance

*Information highly packed

*High level of usefulness in the discipline

Airey & Eriksson (2014)
Materiality:
Colours have meaning.

Rationalization:
Both axes!

Historical anomalies:
Both axes!

Airey & Eriksson (2014)
What are the disciplinary affordances?

Why does the diagram look like it does?

Need a little history lesson…
Annie Jump Cannon

Astronomer from Harvard
Catalogued nearly 400,000 stars
Discovered 300 variable stars
First woman to gain a honorary doctorate from Oxford

Worked at Harvard for 40 years but only received tenure two years before retirement.
Annie Jump Cannon

Oh Be A Fine Girl Kiss Me

O B A F G K M
Reordering the horizontal axis

The "colours" of stars (their spectra) were originally classified alphabetically A-Q.

Cannon rationalized the classification to make more sense from an astrophysical point of view.

The original 17 alphabetical categories became seven ordered O B A F G K M.
Brightness

The vertical axis apparent magnitude

Hipparchos (≈150 B.C.)
Six levels:
Brightest: magnitude 1
Faintest: magnitude 6
Brightness

Stars are at different distances from us.

Astronomers wanted a standard brightness value.

**Absolute magnitude**: how bright a star would be at a standard distance from the Earth.

Kept the original scale
The need for pedagogical affordance

Suggest that students cannot deal unaided with the dense disciplinary affordances of disciplinary-specific semiotic resources.

Need semiotic resources with pedagogical affordance to function as a bridge (Airey 2015)
Definition:

The aptness of a semiotic resource for teaching some particular educational content

Airey (2015); Airey & Linder (in press)
Pedagogical affordance

Semiotic resources that have pedagogical affordances:

• Deal with **less information**
  (reduced cognitive load)
• Often **less abstract**
  (this is something you can ’see’)
• Often have **limited use** in the day-to-day work of the discipline (Airey 2015)
Two related affordances

Disciplinary affordance
Usefulness for doing the discipline

Pedagogical affordance
Usefulness for teaching the discipline
Pedagogical vs disciplinary affordance

Disciplinary affordance

Pedagogical affordance

Airey (2015)
In books coordinates appear fixed.

One major disciplinary affordance of coordinate systems is that they are not fixed.
Coordinate systems
Coordinate systems
Coordinate systems

Coordinate systems have high disciplinary affordance

But how can you teach this?
Pedagogical vs disciplinary affordance

Disciplinary affordance

Pedagogical affordance

Airey (2015)
Summary

Suggest that these two terms are useful when analysing disciplinary teaching and learning.
Summary

Disciplinary Affordance

The agreed meaning making functions that a semiotic resource fulfils for a particular disciplinary community.

Pedagogical Affordance

The aptness of a semiotic resource for teaching some particular educational content

These two are often in functional opposition
Conclusion

Suggestion:

Disciplinary affordance
Pedagogical affordance
Conclusion

Suggestion:

Disciplinary affordance
Pedagogical affordance

Useful devices for thinking about teaching and learning sequences in a discipline.
Thanks for listening!


