Representing the Cosmos

Affordances of disciplinary specific semiotic resources in Higher Education Astronomy

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Introduction: My PhD project

- Astronomy knowledge through representations.
- Paired PhD project: Astronomy Education & Astronomy.
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- Astronomy knowledge through representations.
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My PhD project

• My main theoretical approach: Social Semiotics.

• What is Social Semiotics?

➢ The study of the development and reproduction of specialized systems of meaning making in particular sections of society.

  Airey & Linder (2017)
  (See also Halliday, 1978; van Leeuwen 2005)

➢ Use as a lens to understand teaching and learning in undergraduate physics.
My PhD project

• Why Social Semiotics? Airey & Linder (2017):
  - Group meaning making.
  - All forms of meaning making.
  - Range of meaning potentials.
Work in Progress

- Knowledge Creation:
Work in Progress

- Knowledge Creation:

- Knowledge Mediation:
Object of learning (Marton & Morris, 2002):
Work in Progress

Object of learning (Marton & Morris, 2002):

- Created
- Intended
- Enacted
- Lived

How to collect data:

- Researcher Participation
- Interviews with teachers
- Lectures & Textbooks
- Interviews with students
Work in Progress

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Semiotic Audit

- Documentation of semiotic resources (Van Leeuwen, 2005)
- Three astronomy courses: Astrophysics and Cosmology, Cosmology, Observational Astrophysics
- Lecture observations as student / researcher
- Textbook analysis
Semiotic Audit

Onsala Space Observatory
Multimodality in Astronomy
What do you see in this picture?
What do you see in this picture?
Appresentation

• Appresent aspects: experienced but not directly observable (Marton & Booth, 1997).

• Novice & Expert experience in Astronomy.

• Professional Vision (Goodwin, 1994): experiencing appresent aspects.
Appresentation in Astronomy: The CMB map.

• The Cosmic Microwave Background:
Appresentation in Astronomy: The CMB map.

- The Cosmic Microwave Background:
Appresentation in Astronomy: The CMB map.

- Appresent Aspects:
  - Temperature fluctuations.
  - A 2D map of the sky.
  - Microwave radiation.
CMB: Making the appresent present.

- Appresent Aspect # 1: Temperature fluctuations.
  - Colour - Temperature scale.
  - Very small fluctuations.
CMB: Making the appresent present.

- Appresent Aspect # 2: Map of the Sky
  - Whole Sky Survey
  - 2D projection

Credits: ESA website
CMB: Making the appresent present.

- Appresent Aspect #3: Microwave Radiation
  - Optical vs Microwave.
  - Hint for structure.

Credits: ESA website
CMB: Making the appresent present.

- Further meaning making potential

- Variation Theory (Marton & Booth, 1997; Marton & Pang, 2013).
• Our aim:
  ➢ Knowledge creation and mediation.
  ➢ When & what is apparent?
  ➢ How can we unlock it?
Summary: Making the appresent present

Affordances of Modes (Simulation, Scales, Colour)

Variation of Modes

Unlocking Appresent Aspects
Summary: Making the appresent present

- **Appresentation**: A "necessary evil"
- Experts experience appresent aspects
- Novices do not experience appresent aspects
- Multimodality: Key in unlocking
Summary
Summary
THANK YOU FOR LISTENING!
References


References

Marton, F., & Pang, M. F. (2013). Meanings are acquired from experiencing differences against a background of sameness, rather than from experiencing sameness against a background of difference: Putting a conjecture to the test by embedding it in a pedagogical tool. Frontline Learning Research, 1(1), Article 1. https://doi.org/10.14786/flr.v1i1.16