

Introduction - Variation Theory Conference

“Powerful ways of acting spring from powerful ways of seeing” (Marton et al., 2004, p. 5)

16th February 2015

2-5pm

Programme

1:15-2:00	Registration and lunch
2:00-2:30	Introductions and Variation Theory for beginners – Learning Outcome Circle
2:30-3:00	Reporting on Variation Theory study and group discussion 1
3:00-3:15	Break
3:15-3:45	Variation Theory for beginners – Patterns of Variation
3:45-4:15	Reporting on Variation Theory study and group discussion 2
4:15-4:45	Plenary discussion and exemplification
4:45-5:00	Planning for next steps and future studies

“The teacher as researcher”

‘the teachers as a researcher’ who engages in systematic self-study ‘through the study of the work of other teachers and through the testing of ideas by classroom research procedures’ (Stenhouse, 1975, Ch 10)

Powerful ways of seeing

“Powerful ways of acting spring from powerful ways of seeing” (Marton et al., 2004, p.5)

A powerful way of seeing an object is to discern multiple features simultaneously.

Variation Theory and Learning Study

This Variation Theory conference is part of a wider project associated with teacher and curriculum development through the use of Learning Study.

Variation Theory for beginners

Learning Outcome Circle

Example 1: The tomato



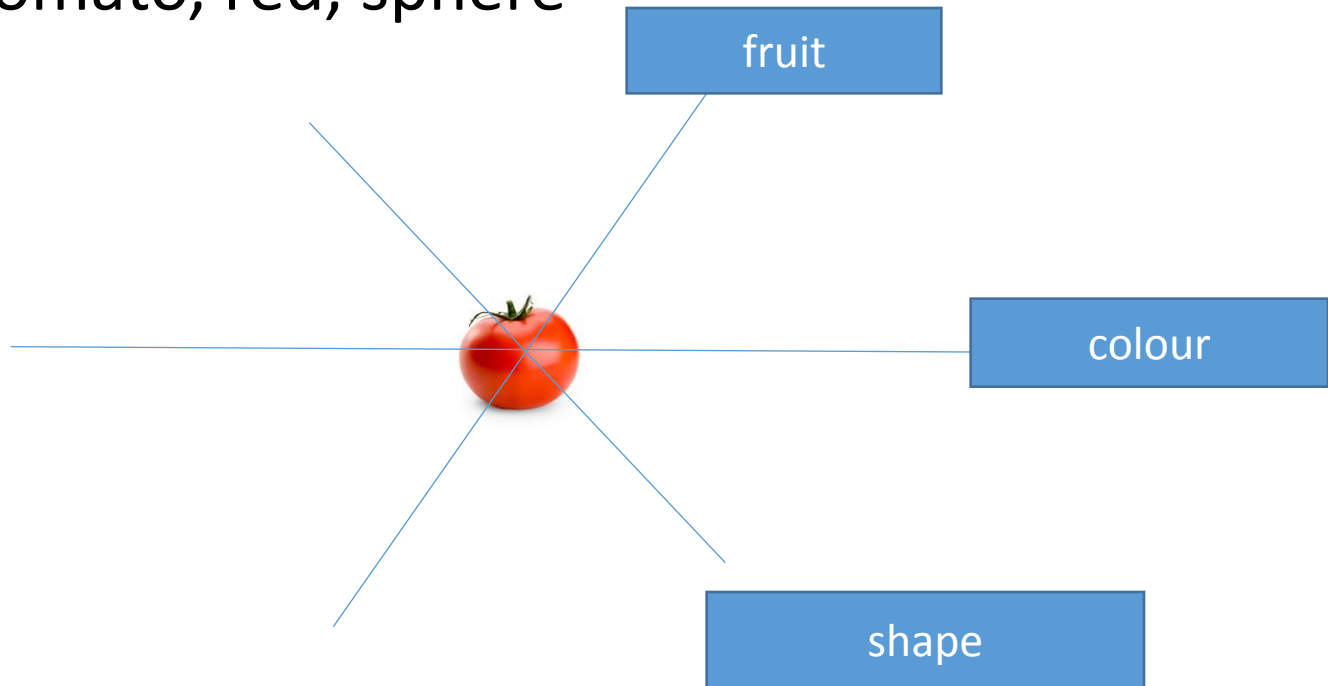
How do you experience this?

- Red
- Tomato
- Approximation to a sphere
- A fruit
- Source of nutrition
- Inedible stalk
- Death threat

Example 1: The tomato

Aspects: fruit, colour, shape

Features: tomato, red, sphere



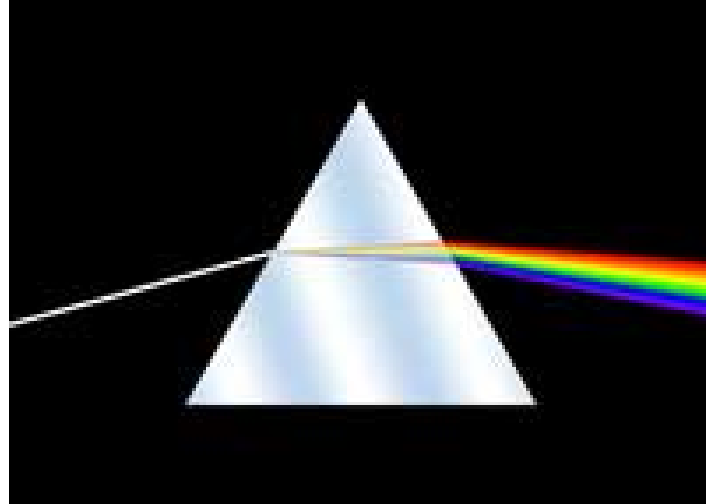
Critical aspects and critical features

Aspect: a dimension, or variable. For example “fruit” or “types of force”.

Feature: a value on a dimension or variable value. For example “tomato” or “friction”

Critical aspects or critical features: for certain groups of learning particular aspects or features of the object of learning will be the most important.

Example 2: Splitting white light using a prism



Activity:

What are the aspects (dimensions) of this phenomena?

What are the features (values) of this phenomena?

Example 2: Splitting white light using a prism

Answers based on Lo, Chik and Pang (2006)

Aspects	Features
Colour of incident light	White
Angle of incidence	Angle producing spectrum
Object doing the splitting	Prism
Colour of dispersed light	Spectrum

Variation Theory for beginners

Pattern of Variation

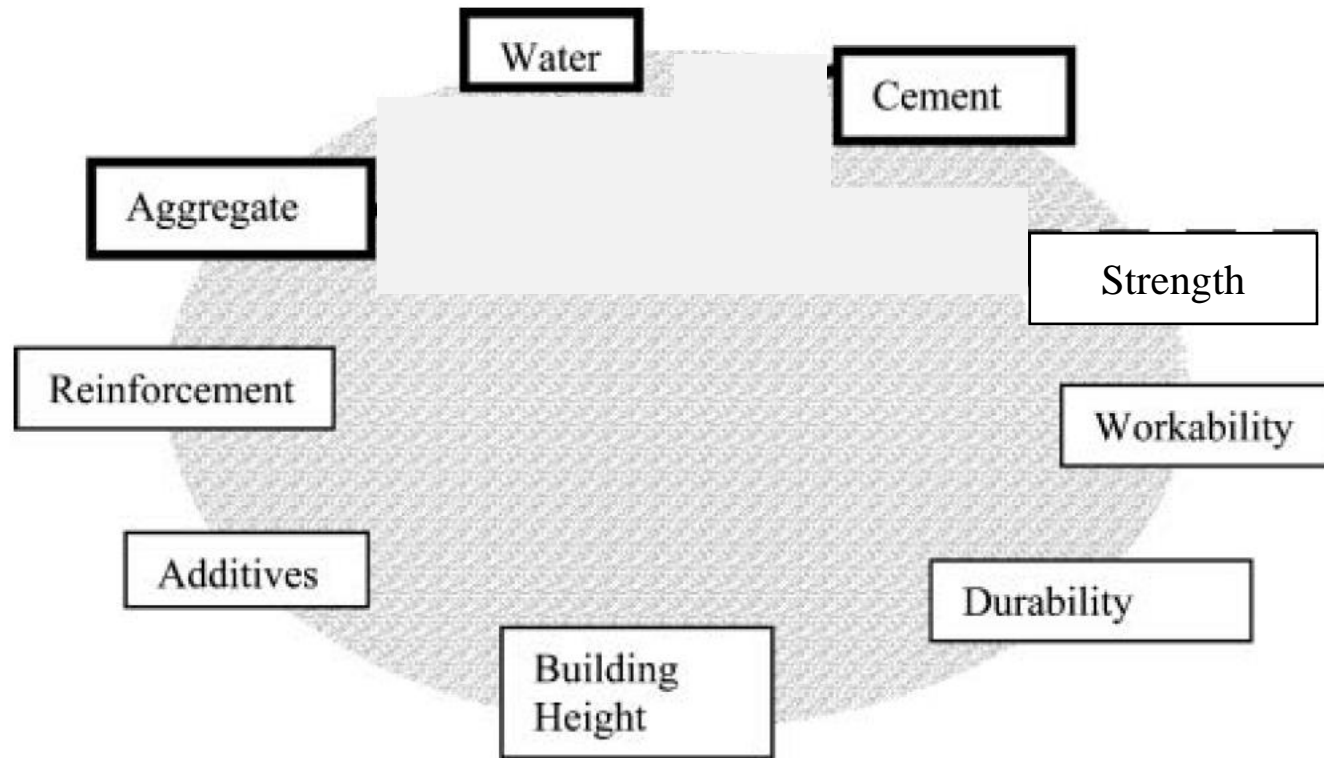
Concepts and Conceptions

- **Concepts** – students either know or do not understand a concept.
- **Conceptions** – students may have different conceptions which can be improved upon.

Concepts, aspects and features are not quite the same as they emphasise different things, however, I am going to use them in a very similar way.

Learning Outcome Circle

For **concrete** - Davis and Dunnill (2008)



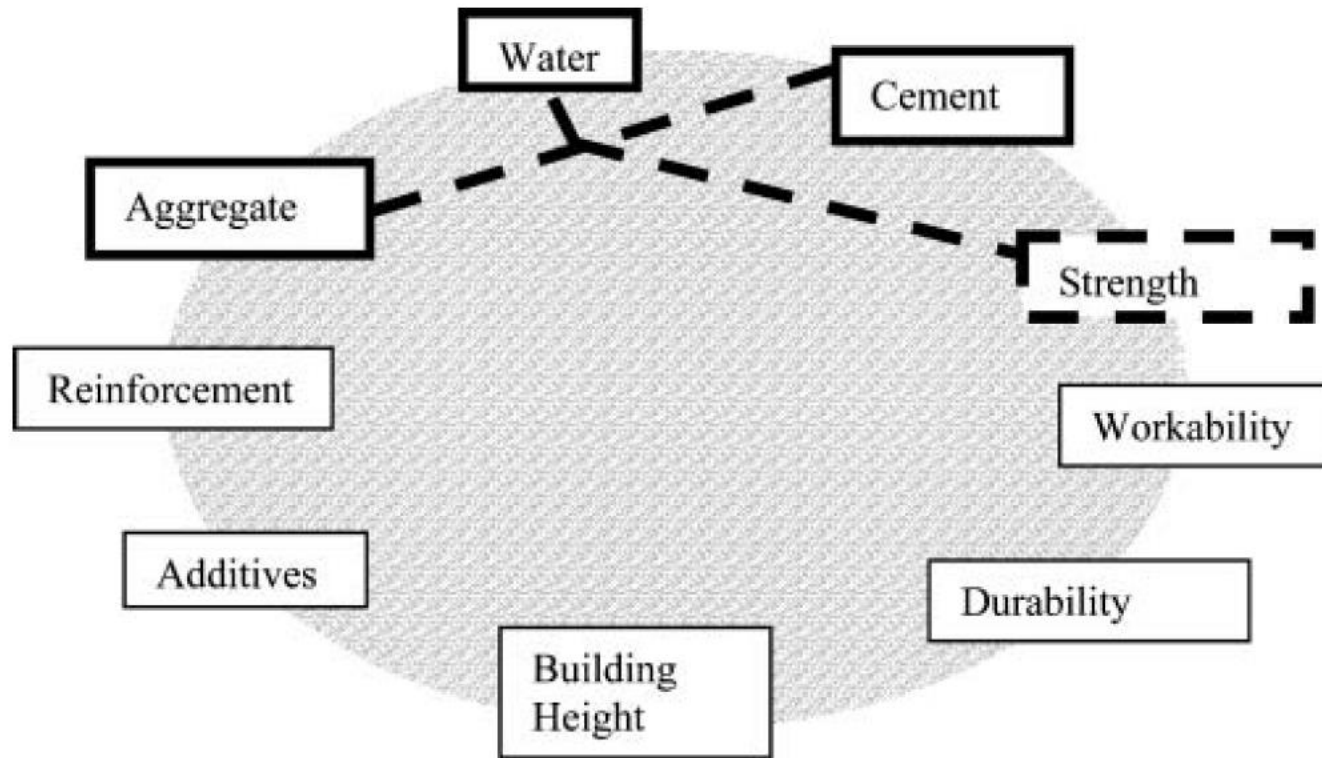
Conceptions of concrete

1. Concrete combines water, cement and aggregate (continuous bold edges of three boxes) – **does not allow for variation in the characteristics of concrete.**

Example from: Davies and Dunnill (2008, p. 7)

Learning Outcome Circle

Davis and Dunnill (2008)



Conceptions of concrete

2. There is a relationship between the strength of concrete and the relative proportions of water, cement and aggregate (as indicated by the bold dashed lines) – **a more sophisticated conception.**

Example from: Davies and Dunnill (2008, p. 7)

Experiencing different aspects simultaneously

Sophisticated understandings of phenomena require that learners experience multiple aspects simultaneously. For example that a fruit has colour, shape and size.

Another example is that to understand speed a learner needs to experience speed as change of distance and change of time and also consider the potential that speed is variable over the distance travelled.

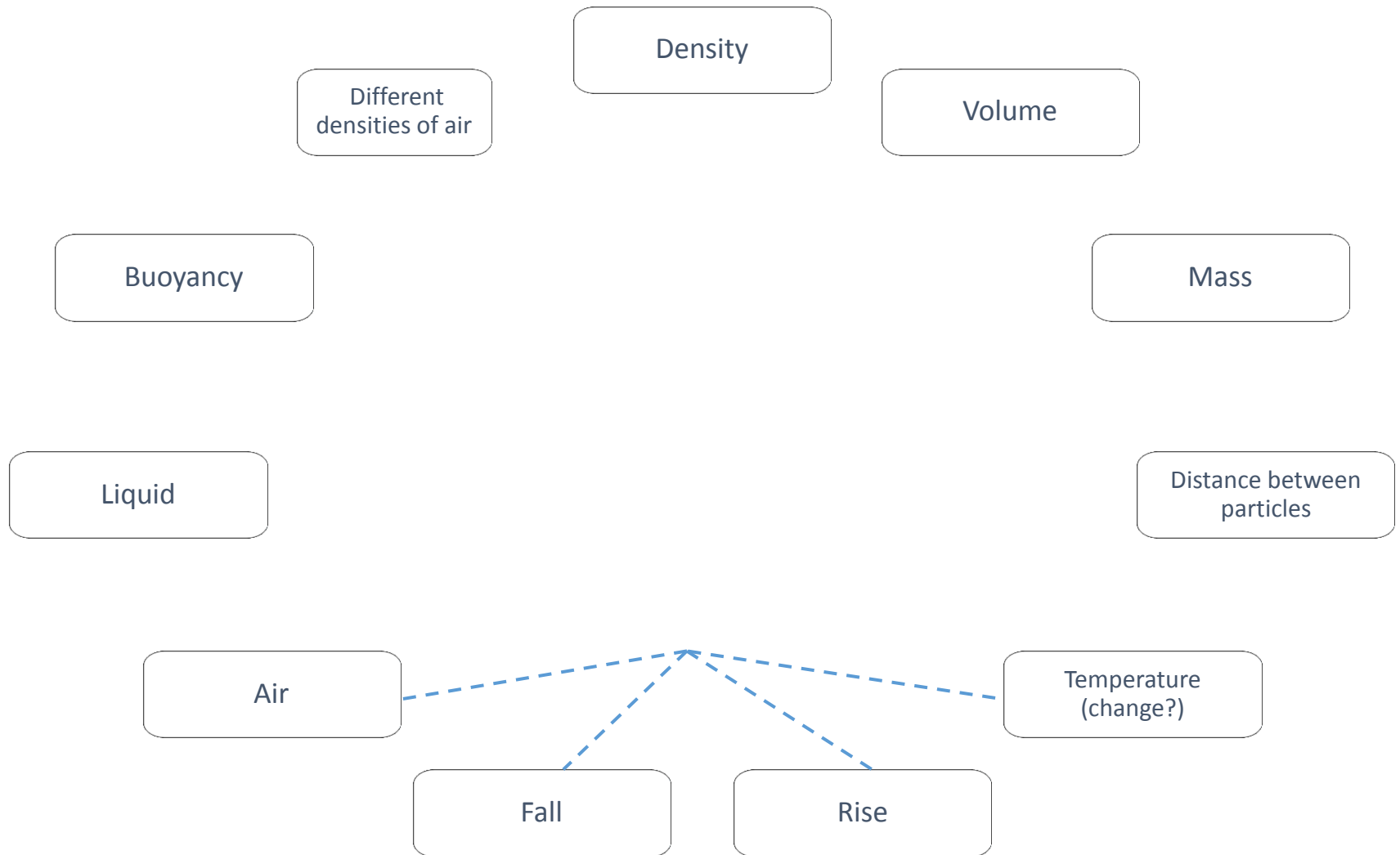
Convection in air

Activity (5 minutes)

Produce a Learning Outcome Circle for convection in air.

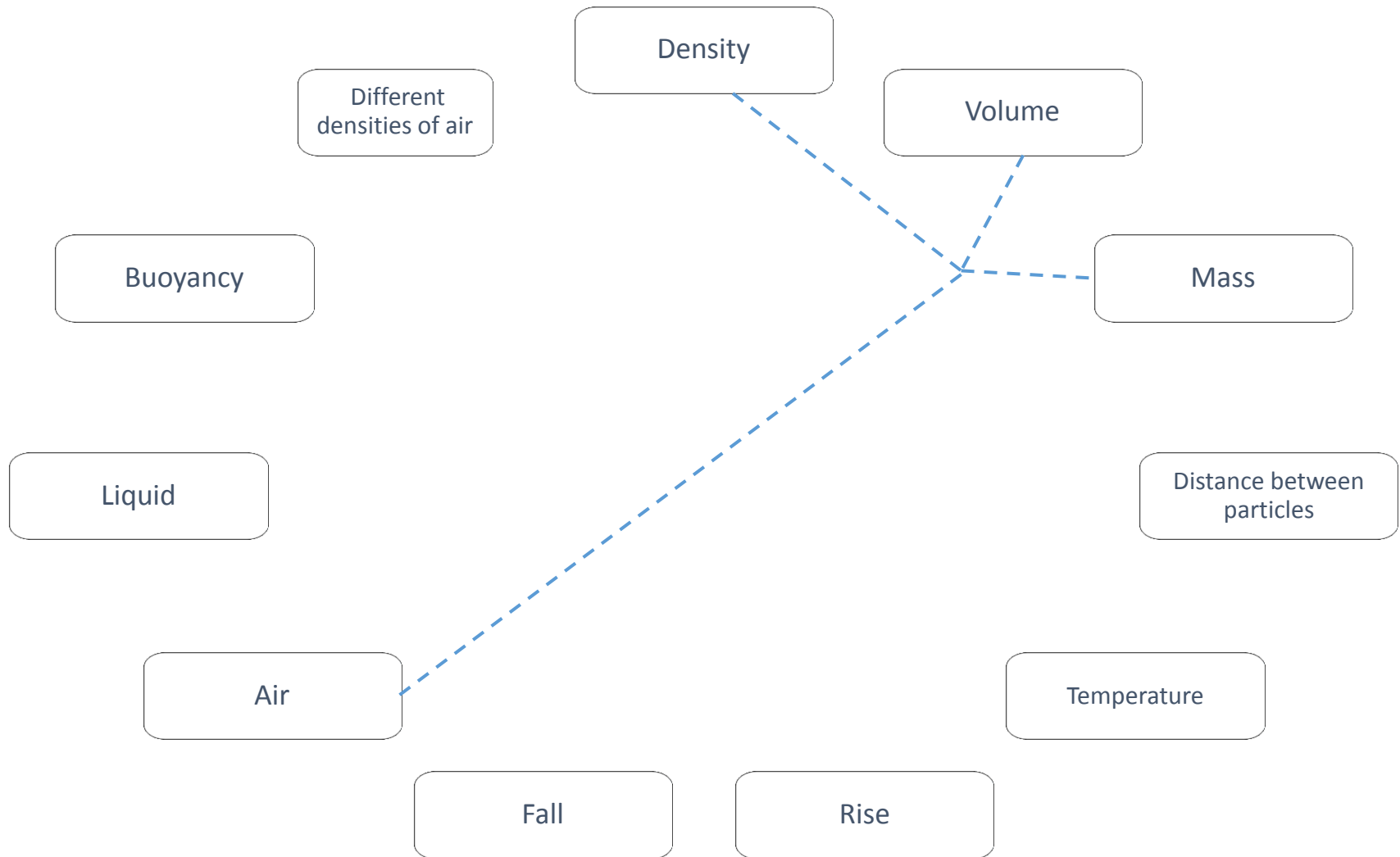
Conceptions of convection: Temperature changes in air leading it to rise or fall

"An increase in the temperature of (some) air can cause it to rise. A decrease in the temperature of (some) air can cause it to fall.



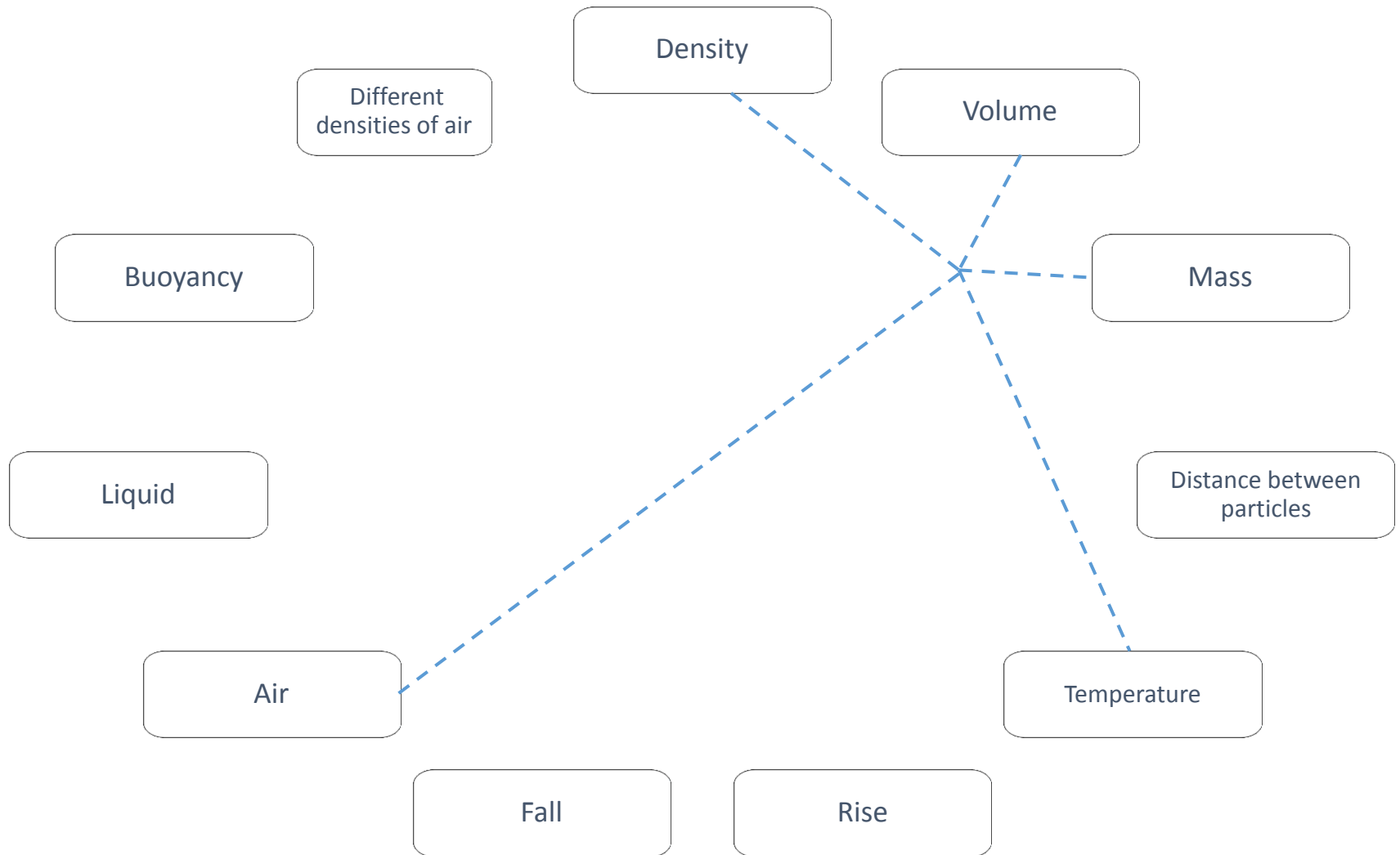
Conceptions of convection: Relationship between mass, volume and density of air

“For a particular mass of air, the volume of the air determines the density of the air. The greater the volume the air the lower its density.”



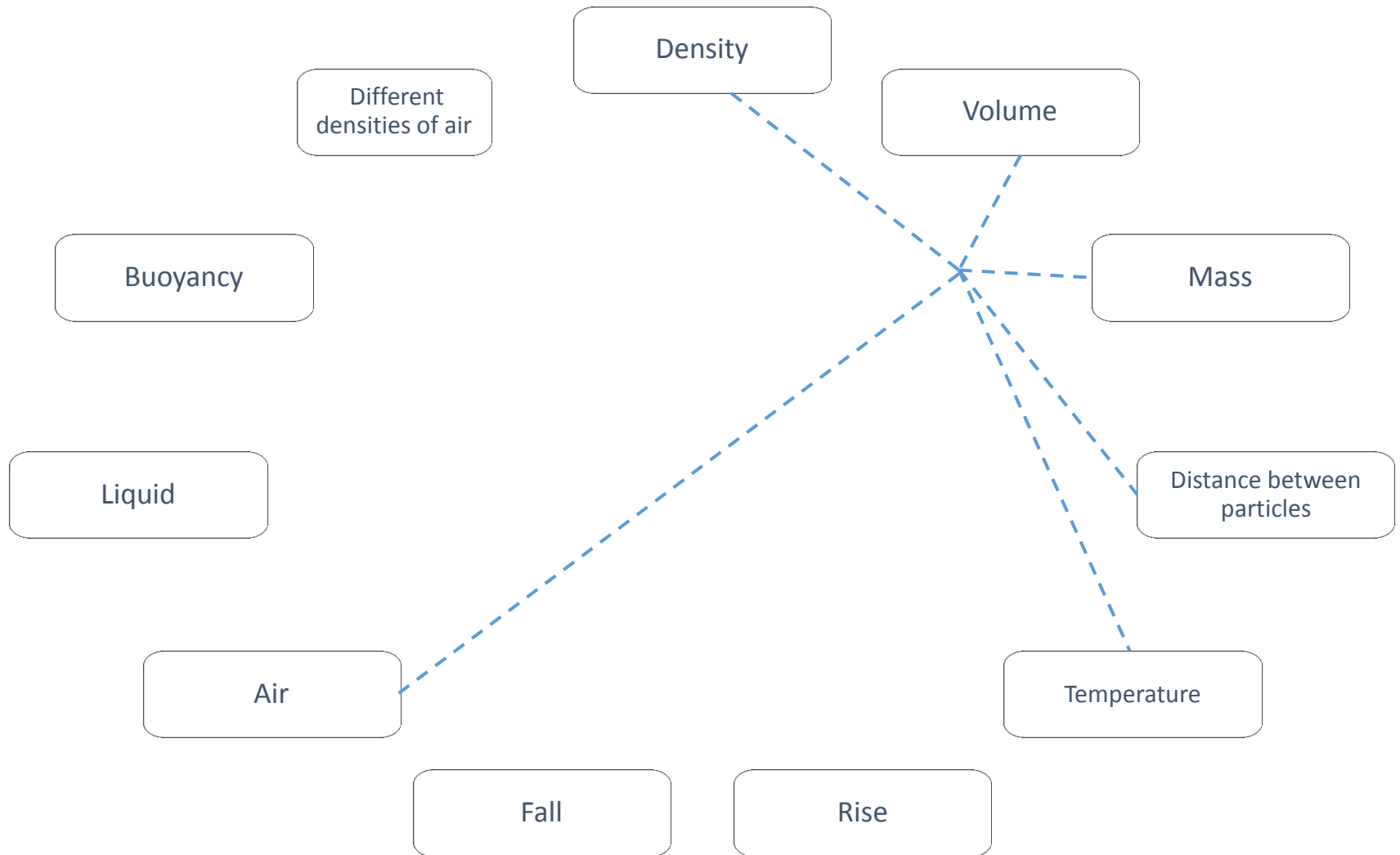
Conceptions of convection: Relationship between density and temperature.

“For a particular mass of air, the temperature of the air determines the volume of the air. The higher the temperature of the air the lower its density.”



Conceptions of convection: Explanations of density using particle model

“For a particular mass of air, the temperature of the air determines the distance between particles. The higher the temperature of the air the further the particles and the lower the density of the air.”



Variation Theory - More about powerful ways of seeing

Planning for teaching

Conjecture of Variation Theory

“Meanings are acquired from experiencing differences against a background of sameness, rather than from experiencing sameness against a background of difference.” (Marton and Pang, 2013)

Patterns of variation

Contrast

(Separation)

Fusion

(Generalisation)

(Marton and Tsui, 2004; Marton and Pang, 2006;
Marton and Tsui, 2004).

Contrast

Contrast is where the learner experiences variation such that a particular value or feature is brought to their attention.

For example to experience what “black” is, the learner must experience other colours such as red or white. Only after having experienced other values (red, white, etc.) of the aspect (colour) can the learner discern the specific colour of black (Guo and Pang, 2011)

Fusion

Fusion is where the whole-part relationship between critical aspects is taken into account.

Students would, therefore, need to experience all critical aspects at the same time. An example of this is in fractions teaching students would need to experience both numerator and denominator at the same time (Lam, 2012). During fusion a learner will experience individual parts of a phenomena at the same time as the whole of the phenomena. Thus they would be able to experience the apple described as an apple, red and a piece of fruit simultaneously.

Pedagogy – putting the conjecture to use

Lo and Marton (2012) suggest that the pattern should start with fusion and be followed by contrast and finally fusion.

Prism Example

Aspects	Features
Colour of incident light	White
Angle of incidence	Angle producing spectrum
Object doing the splitting	Prism
Colour of dispersed light	Spectrum

Prism example

i = invariant

v = varied

What is to be discerned	Critical aspects			
	Colour of incident light	Angle of incidence	Object doing the splitting	Colour(s) of dispersed light
Prism is <i>one</i> way of splitting white light into a spectrum	i	i	v	i

Prism example

i = invariant
v = varied

What is to be discerned	Critical aspects			
	Colour of incident light	Angle of incidence	Object doing the splitting	Colour(s) of dispersed light
Prism is <i>one</i> way of splitting white light into a spectrum	i	i	v	i
White light can be split into a spectrum of colours	v	i	i	v

Thoughts

- Explained a teacher perspective on what teachers think are critical for learning.
- Teachers only find out what are critical for students DURING teaching.
- How does one exploit the power of LS/VT?
- How do we exploit the power of LS/VT?

What can UoB offer?

- Cover costs for covering lessons for meetings
- Cover costs for observing other teachers
- Travel between schools for meetings
- Support and advice on using VT
- Support and advice on doing Learning Study
- Opportunities to undertake a conceptual based, variation theory informed MEd/MA dissertation.
- Accredited 20 credit Masters level module on Learning Study and Variation Theory.

Implications

In subject / teacher groups discuss:

- What are the implications for your own subject specialism?
- What are the next steps for you based on this afternoon?
- What are the opportunities for collaboration?
 - Between schools?
 - Within schools?