

“A Snapshot of Some of the Issues Surrounding Science Education in Primary Initial Teacher Education (ITE) in Ireland”

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Becoming a Teacher: *Primary Student Teachers as learners and teachers of History, Geography & Science*



Funding

Standing Committee of Teacher Education North and South

St. Patrick's College

Mary Immaculate College

Available

<http://www.spd.dcu.ie/MAIN/news/BecomingaTeacher.shtml>

This benchmark study surveyed all students who entered BEd programmes in Ireland in 2004 in the following colleges:

St Patrick's College

Mary Immaculate College

Church of Ireland College of Education

Froebel College, Dublin

Coláiste Mhuire

Stranmillis University College

St Mary's University College



Becoming a Teacher: Outline of Study

- **Four** year longitudinal study of **undergraduate primary student teachers** in the seven colleges of education on the island of Ireland 2004-2008.
- Student teachers' **attitudes** towards and **perceptions** of history, geography and science on entry to and exit from ITE
- Prior learning **experiences** of student teachers and their **engagement** with school placements and curriculum studies over the course of their ITE
- **Concepts** of good teachers held by the students on entry to and exit from their BEd programmes

Research design

- **Pilot Phase (2003-2004)**
- **Phase 1**
 - Questionnaire focusing on student teachers' prior experiences of, and attitudes towards history, geography and science and on the concepts of good teachers they brought with them to ITE
- **Phase 2**
 - Focus group interviews were conducted in each of the colleges.
- **Phase 3**
 - Questionnaire focusing on student teachers' experiences of ITE and on the concepts of good teachers they held on exit
- **Sample 1114** student primary school teachers

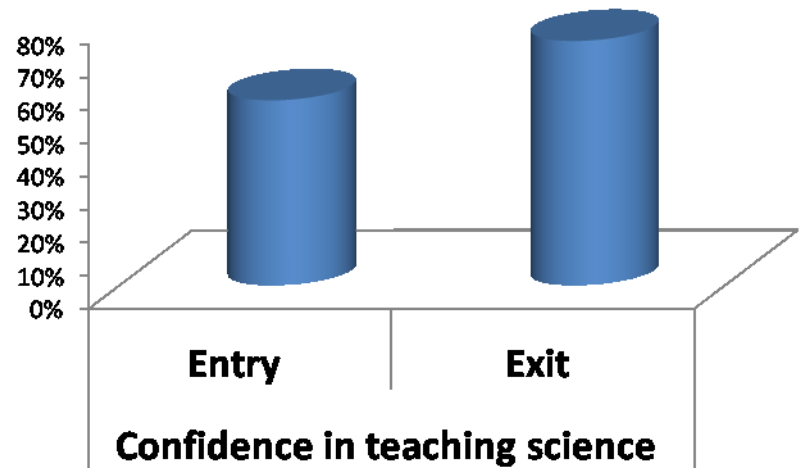
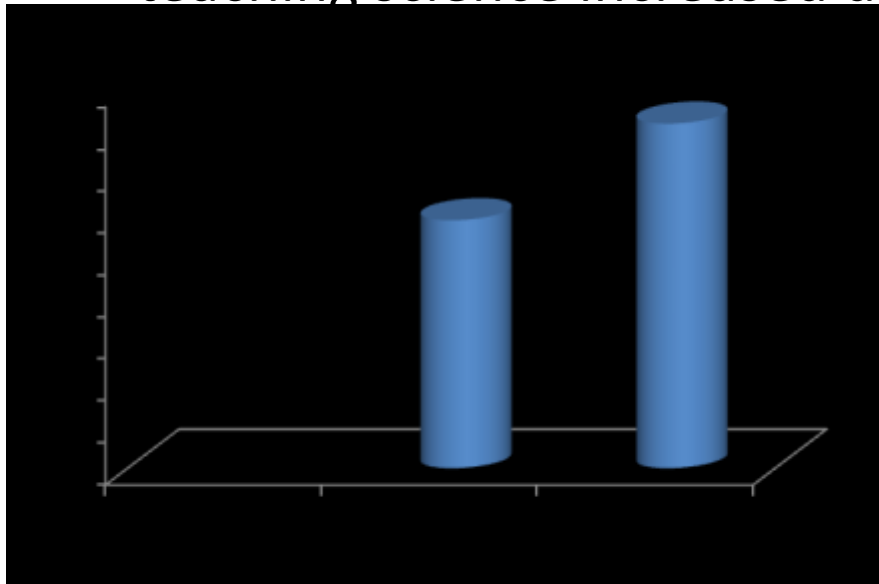
Today's presentation

Focus on Science

- Attitudes towards science
- Concepts of the good teacher
 - What makes a good teacher of Science?
- Experiences of teaching science on Teaching Placements

Attitudes towards science

- Majority of students from both Rol and NI colleges held **positive attitudes towards** and felt **confident about teaching** science at the entry and exit stages.
- There was evidence that their liking of and confidence in teaching science increased during their ITE programme



Attitudes towards science: *Importance of Science*

- Majority maintained science was an **important** subject for children to learn in primary schools.
- Higher levels of importance of science were expressed at the exit stage.

Concepts of a Good Teacher of Science

Focus of research

- What models of good teaching do student teachers bring with them into initial teacher education?
- How do these models change over time?

Categories and themes

What is the good teacher like?

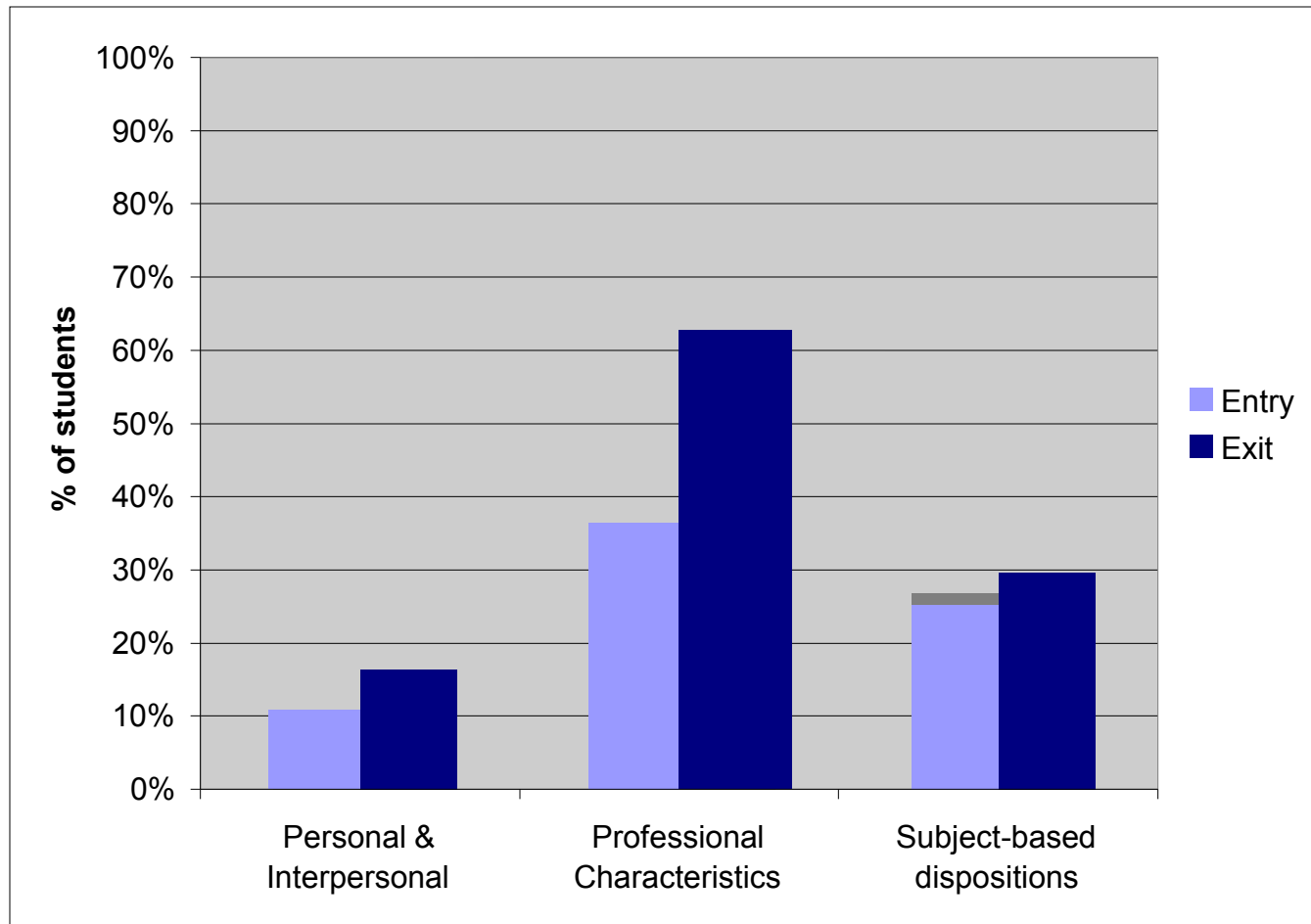
- **Teacher Characteristics**
 - Personal & Interpersonal
 - Professional Characteristics
 - Subject-based dispositions

What does the good teacher do?

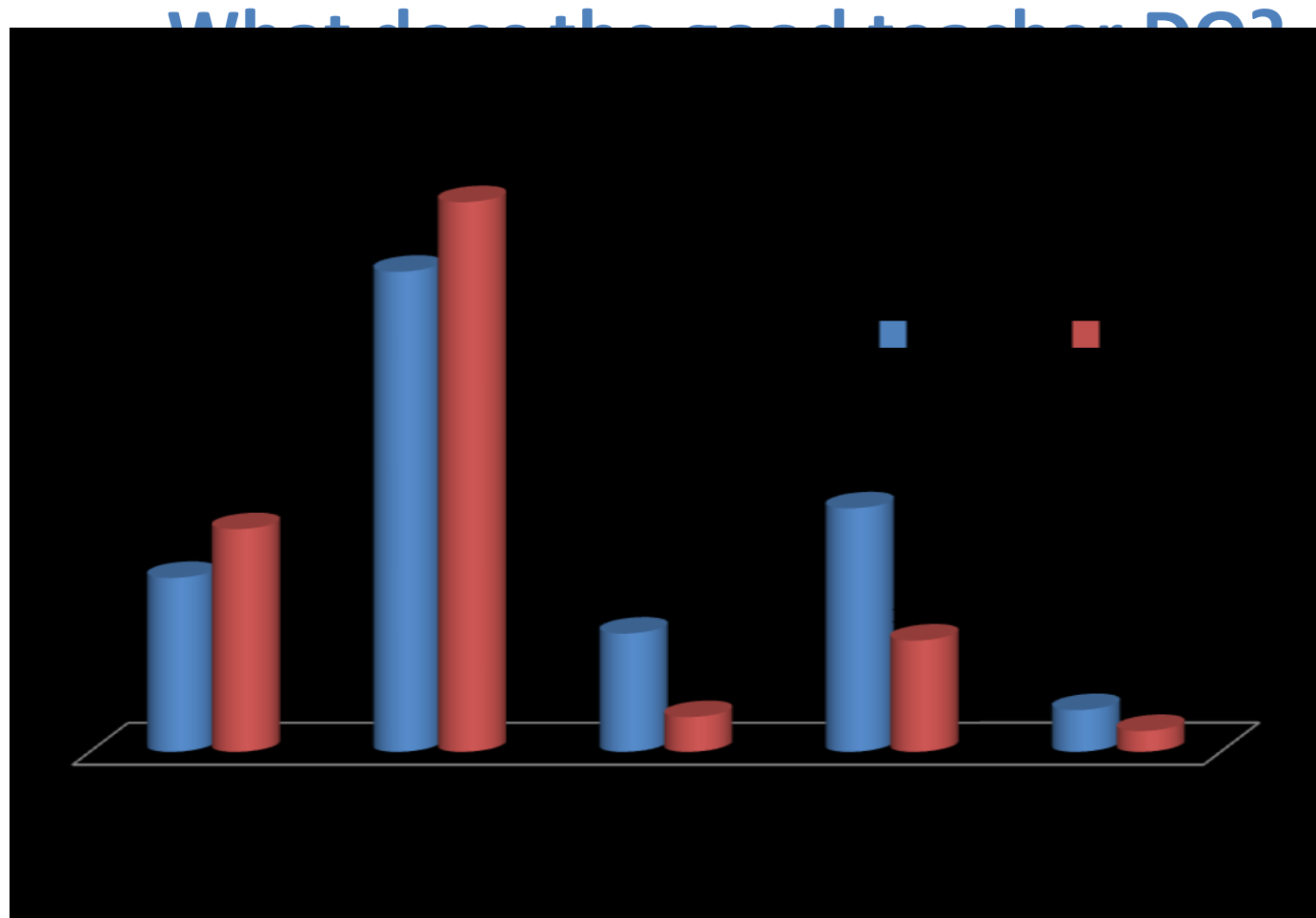
- **Teaching and Learning**
 - Learner-centred
 - Methods & approaches
 - Relevance
 - Motivation & interest
 - What the good teacher does **not** do

What makes a good teacher of Science?

What is the good teacher LIKE? Entry / Exit



What makes a good teacher of Science?



A good teacher of science

A teacher who allows the children to learn scientific concepts through experimentation and not just the teacher telling the children everything. (Rol, exit)

One that values a hands on approach and engages the children in scientific thinking (NI, exit)

Willing to incorporate group work. Willing to allow exploration and experimentation . Sees value in the process itself (not just a textbook) (Rol, exit)



Most frequently mentioned learning approaches

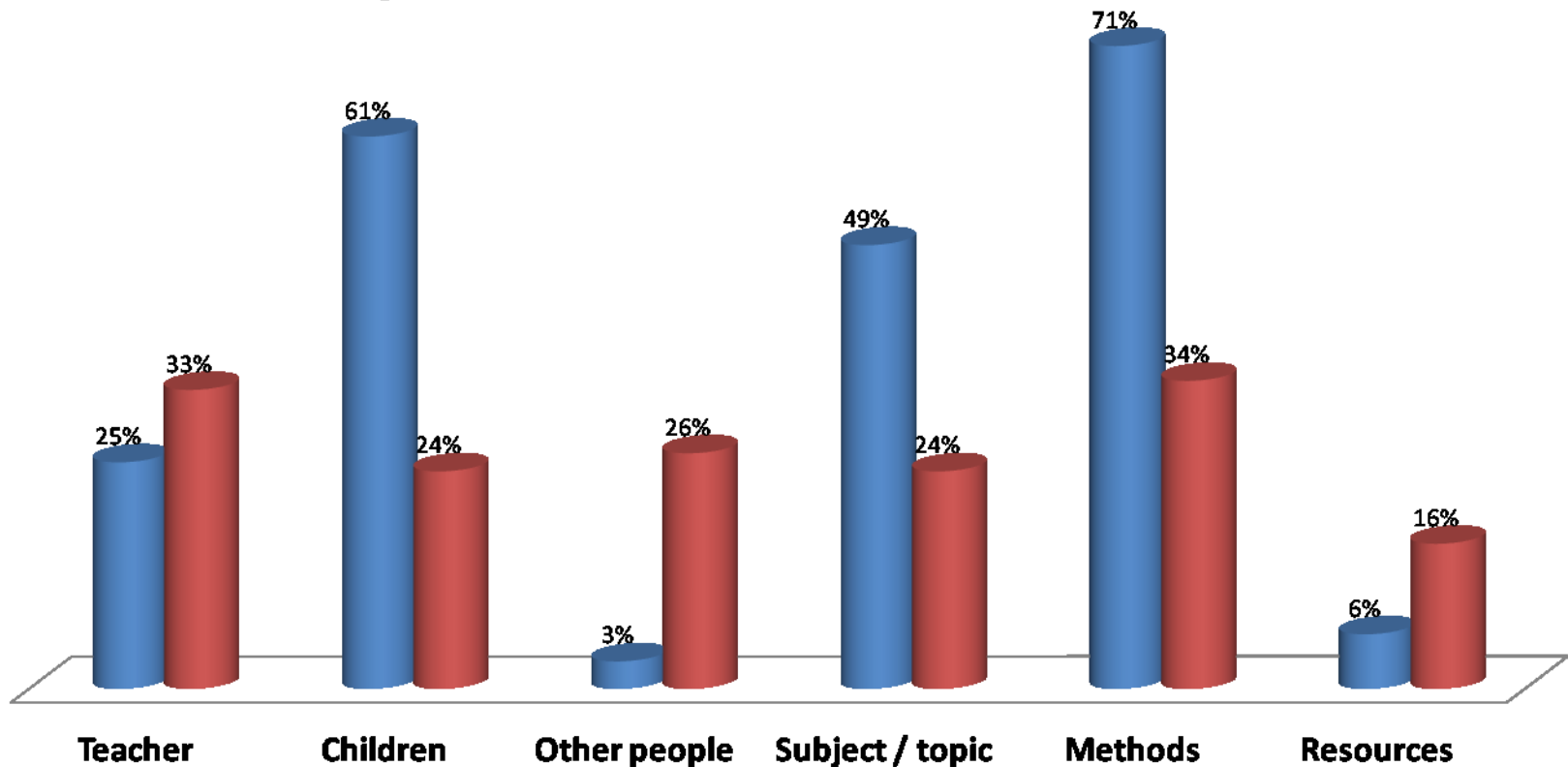
Learning approaches / Methods	Entry	Exit
Active learning	59%	74%
Scientific investigation	40%	52%
Experiments	36%	35%
Field work	3%	2%

Categories relating to experiences on school placement

Category	Sub-category	Category included comments relating to:
Learners and Teachers	Teacher	Their actions as student teacher
	Children	Class Children Individual children
	Others	Class teacher Principal Curriculum designers Producers of resources
Teaching and Learning	Subject Specific	Topics / strand units within science Learning science
	Methods	Methods of teaching Methods of learning Classroom organisation
	Resources	Any classroom resources

Positive and negative comments regarding teaching Science on school placements

■ Positive ■ Negative



Positive comments regarding teaching science on school placements

Children discovering for themselves through experiments. Children disagreeing with me and making up their own experiments

Activities, although difficult classroom management wise ... were invaluable for learning



Negative comments regarding teaching science on school placements

I found it difficult on some occasions when conducting experiments to organise and maintain management ... as the children may not have been used to this methodology of teaching

Some teachers relying heavily on textbooks and not seeing the benefits of constructivist learning

Some children have a much better and quicker understanding of scientific concepts. Sometimes difficult to cater for early finishers



The Good News ...

Student primary teachers throughout Ireland

- Positive attitudes towards science
- Recognise importance of teaching science in primary classroom
- Have positive experiences of engaging with curriculum science courses and teaching placements during ITE
- Feel confident about teaching science

General Issues

- Virtual absence of ICT
 - NI and RoI
- Small presence of ideas relating to children's voice and ownership
- Shift away from key idea of making science relevant to children
- Little reference to teaching and learning science outside the environment of the classroom
- No references to Nature of Science, History of Science & Science and Society

Following on from the IASSEE Study

(Waldron, Pike, Murphy, Greenwood, Dolan & Kerr, 2009)

The study did NOT report on:

- Students' science qualifications on entry to ITE;
- The impact of ITE course on students' conceptual knowledge;
- Students' concerns regarding teaching science on leaving ITE.

“The impact of a curriculum course on pre-service primary teachers’ science content knowledge and attitudes towards teaching science” (Murphy, & Smith,2012).

Irish Educational Studies, volume 31, issue 1, 2012

Research Questions

- What scientific qualifications do B.Ed students have on entering ITE?
- To what extent do B.Ed student teachers' scientific concepts develop as a result of the curriculum science methods course?
- What concerns do B.Ed students hold regarding the teaching of primary science?

Research Method

- **Questionnaire:** administered to **353** B.Ed students prior to and at the end of their second year curriculum science methods programme.
- Open and closed questions

The Questionnaire

- **First section**

- Contextual information

- Sex of the student teachers

- Academic qualifications in science at post-primary and tertiary levels

- **Second section**

- Open-ended questions: Students' attitudes towards teaching science

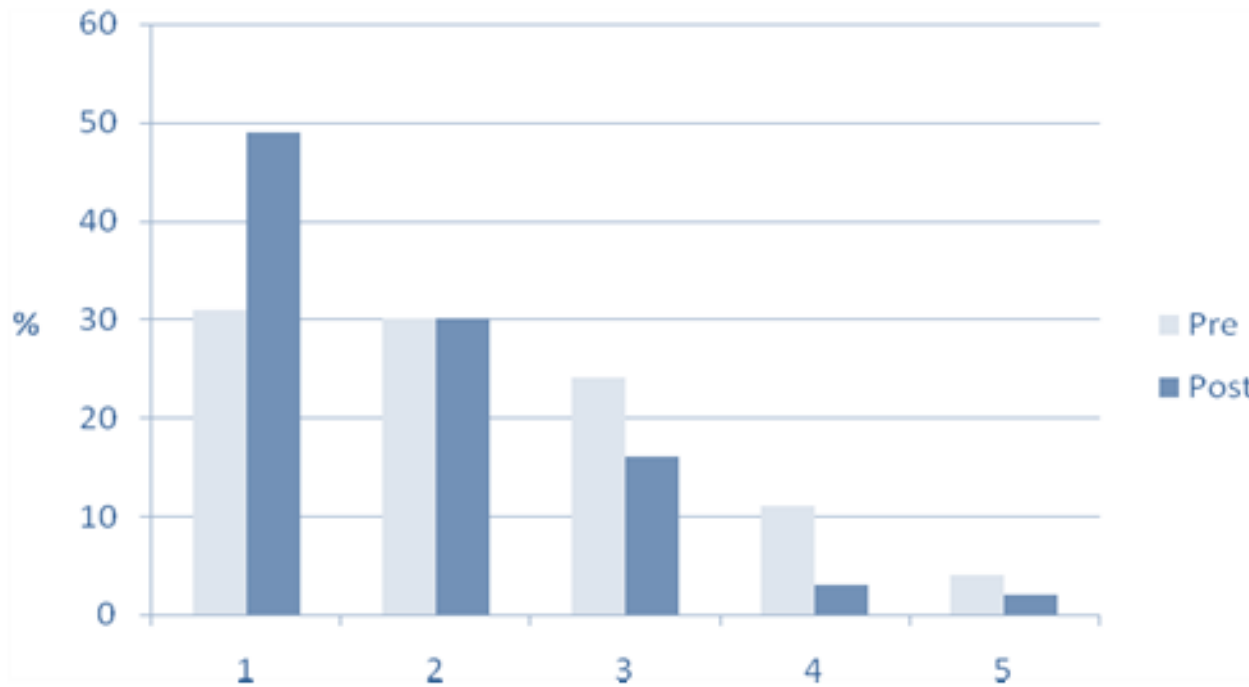
- **Third section**

- Statements regarding different aspects of biology and physics

- Related to learning objectives from different strand units of Primary Science Curriculum 9 DES, 1999)

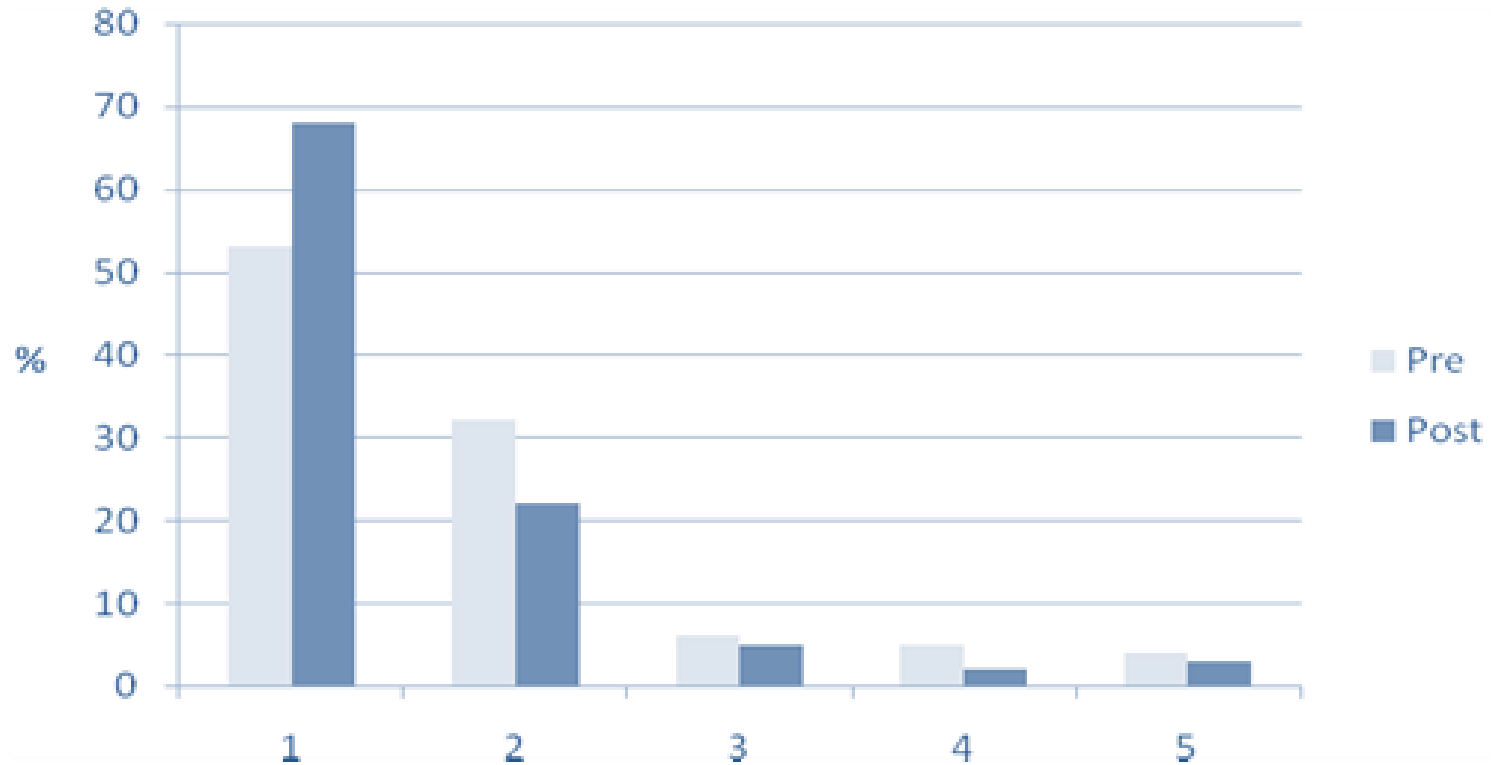
- Representative of some of the commonly held 'alternative conceptions' about science (Driver 1983; Summers and Kruger 1992; Smith and Peacock 1992; Jarvis and Pell 2004

I like science



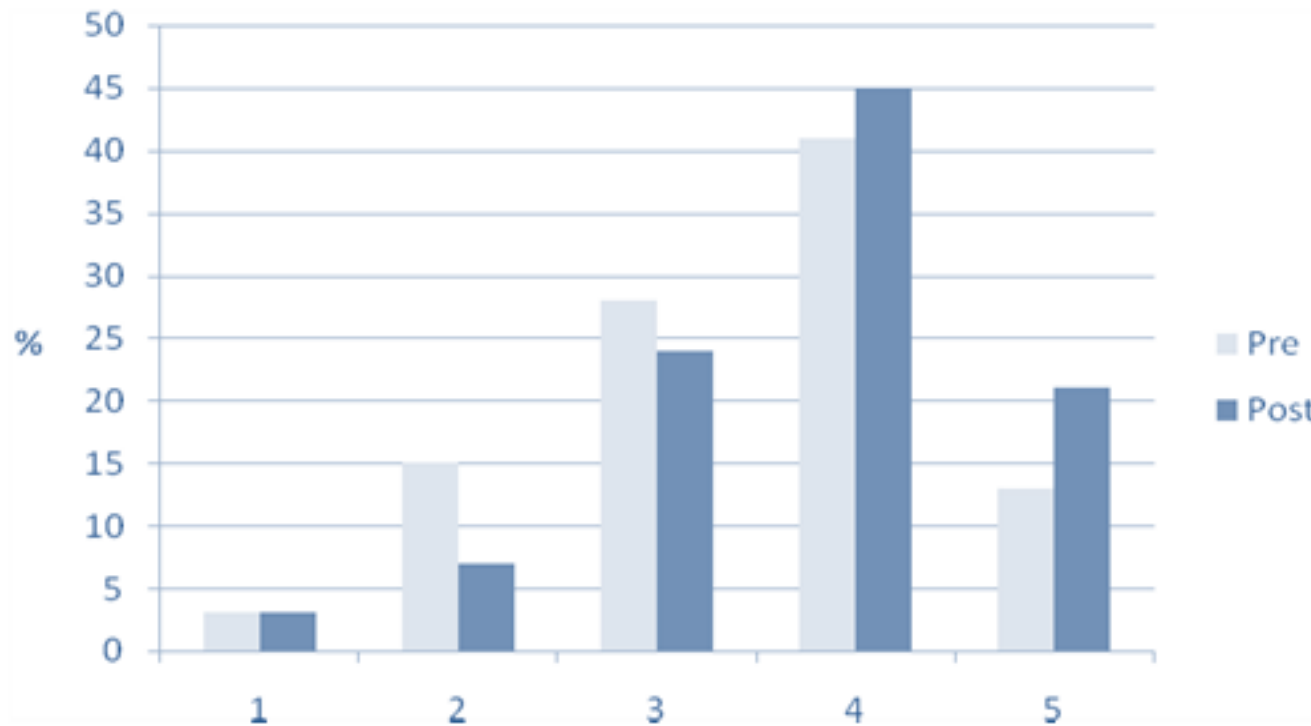
(- strongly agree, + strongly disagree)

I think science is an important subject



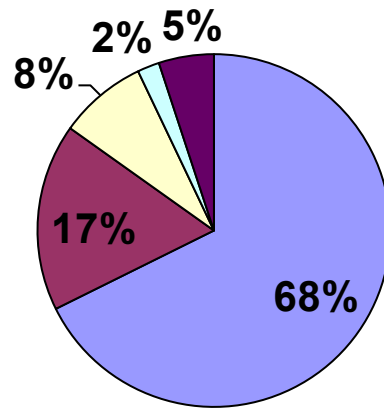
(1 = strongly agree, 5 = strongly disagree)

I feel confident about teaching science



(1 = least confident and 5 = most confident)

Percentage of Students Taking Science Subjects to Leaving Certificate



■ Biology

■ Chemistry

■ Physics

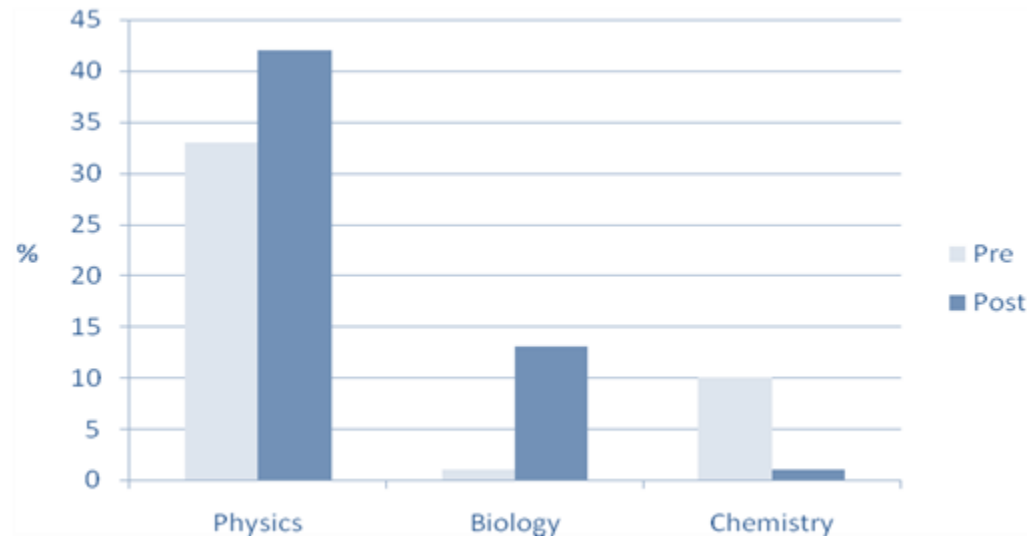
■ Physics/Chemistry

■ Agricultural Science

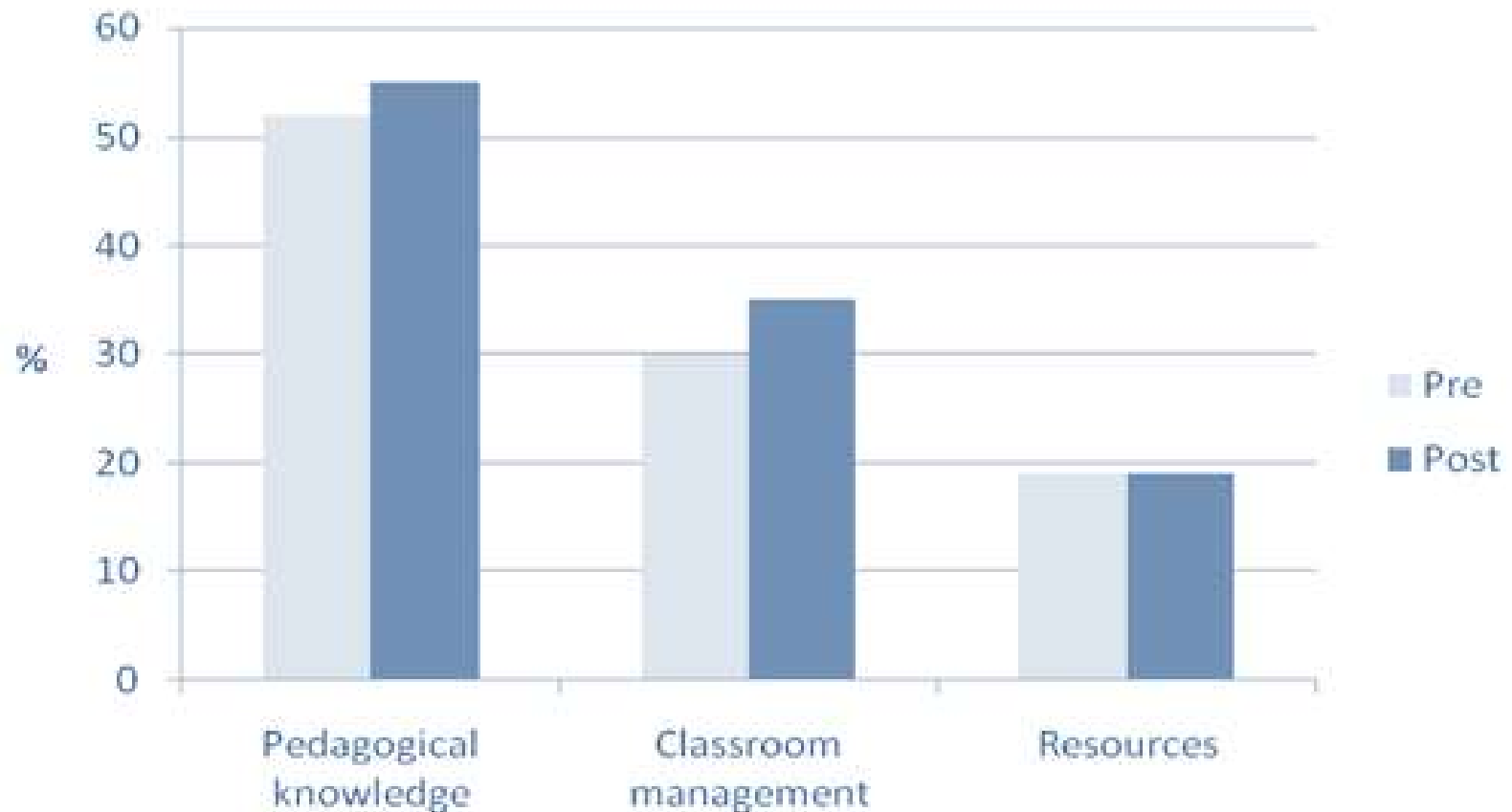
Statement (True or false)	% Correct Initial Questionnaire	% Correct Exit Questionnaire
Gravity only acts on objects when they are falling	94	96
Friction only acts on moving objects	33	58
Heavy things fall to the ground quicker than light things	38	75
Objects which are sitting still have no forces activity on them	89	95
The moon is luminous	60	69
Sound can only travel through air, not solid or liquid	81	95
Less current returns to the battery when it passes through say a bulb (it is used up)	45	68
Current flows from battery to bulb but not from bulb back to battery	63	77
If an object is at rest no forces are acting on it	82	82
Wood floats and metal sinks	33	58
All metals are attracted to a magnet	67	74
Heat travels from a cold body to a hot body	63	76
If two objects have the same temperature they have the same amount of heat	78	83

Table 2: Statements relating to Strand: Living Things (Plants)		
Which of the following are plants (Tick)	% Correct Initial Questionnaire	% Correct Exit Questionnaire
A tree in the ground	73	88
A potato growing in the ground	61	80
A thistle growing in the ground	68	80
A daisy growing in the ground	72	84
Statements relating to Strand: Living Things (Animals)		
Which of the following are animals (Tick)	% Correct Initial Questionnaire	% Correct Exit Questionnaire
A fish in a pond	42	64
A dog found around the house	90	95
A human being	56	73
A common household fly	34	61
An elephant	86	94
A snake	59	71
A spider	35	62

Concerns regarding scientific content knowledge



Concerns regarding teaching Science



Findings to reflect on...

- Considerably higher percentages of this cohort taken Biology to Leaving Certificate level than either Chemistry or Physics
- **Good News:** At end of science course
 - Students more positive attitudes about science and the importance of school science
 - Students more confident about teaching science
 - Was increase in students' scientific content knowledge in both Physics and Biology

Findings to reflect on

Concerns ...

At end of the course many of these students

- Still held '*inaccurate conceptions*' in both disciplines
 - Vast majority only science course prior to teaching
 - Do they have sufficient content knowledge to competently implement primary science curriculum?
- Indicated concerns regarding their pedagogical knowledge & classroom management
 - But would have had 2 more teaching placements after the exit questionnaire was administered
- Reported concerns regarding resources

Questions on which to reflect

- Student teachers have very positive attitudes towards science, think it's important to teach science, have good PCK of science and have good conceptions of the characteristics of a good science teacher. **How can we ensure that these attitudes and knowledge are translated into classroom practice when they embark on their teaching careers? What factors might impede this?**
- Many primary student teachers hold similar '*inaccurate conceptions / misconceptions*' as their pupils may hold and therefore may not have sufficient scientific knowledge to competently facilitate the implementation of the Primary Science Curriculum. **What can / should be done to address this?**