

# THE RELATIONSHIPS BETWEEN PRIMARY TEACHERS' ATTITUDES AND COGNITION DURING A TWO YEAR SCIENCE IN-SERVICE PROGRAMME

TINA JARVIS, ANTHONY PELL

*University of Leicester, UK*

## ABSTRACT

Teachers' confidence and attitudes towards science teaching and science understanding were tested before and after a major in-service programme in 31 schools. The 70 teachers' attitudes were assessed using a 49-item Likert-scale test. Science understanding was measured by multi-choice and open-ended questions. Data on pupils' attitudes and cognition was also collected. After in-service, overall teachers' initial confidence about science teaching had improved significantly. The majority of teachers, but not all, had developed satisfactory levels of understanding and more positive attitudes. Teachers responded to the in-service programme in different ways. Four teacher types were identified: high attainers who improved attitudes and confidence; teachers with limited science knowledge who found the course difficult but made improvements; unaffected professionals who were already working well and for whom the course had little effect; and disaffected teachers who showed low levels of confidence and competence throughout. Pupil cognition and attitudinal differences related to these types were found.

## 1. INTRODUCTION

In many countries primary teachers' background knowledge in science is very variable with the effect that they lack confidence and competence in teaching science (Goodrum, Hackling & Rennie, 2001). Science knowledge is a significant factor that influences primary teachers' confidence in teaching science (Harlen & Holroyd, 1997). Teachers with low confidence cope by teaching only the minimum required; stressing aspects they do feel more confident in, such as biology; using prescriptive texts and work cards; underplaying questioning and discussion; and only doing very simple practical work. When these coping strategies become the norm, pupils' attainment will be limited (Osborne & Simon, 1996). It is also likely that pupils' attitudes will be detrimentally effected.

She & Fisher (2002) found that pupils' attitudes towards science were influenced by teachers' behaviour in the classroom, such as asking challenging questions, encouraging, and praising. In addition, they found lower secondary pupils' higher attitudinal scores were associated with higher cognitive scores. While Simpson & Oliver (1990) also found a strong pupil attitude-achievement relationship in their longitudinal study of pupils grade 6-10, they did not find a

relationship between teacher affect and student affect. However, Gallagher (1994) found that pupils' perception that a teacher finds the subject matter interesting may enhance pupils' interest.

If there is a close relationship between teacher knowledge and attitudes which in turn effects pupils' understanding and attitudes, in-service to improve teachers' cognition should influence the other factors. This research set out to explore the changing relationship between teachers' attitudes and cognition with those of their pupils over a two year in-service programme. The research questions to be addressed were:

- What are the attitudinal and cognitive profiles of teachers selected for the in-service course?
- Do the attitudinal and cognitive profiles change after the in-service course?
- Do all teachers respond to the in-service course in the same way?
- Do changes in pupils' attitudes and attainment show any correspondence to changes in teachers?

## 2. SETTING AND PARTICIPANTS

Thirty one inner-city schools took part in a 6 month in-service course focusing on *Developing and Assessing Investigations*. The majority of the schools were considered to have weaknesses in science, as shown by national science tests and/or inspection reports. Thirty-nine teachers from sixteen schools took a 10-day course between January and July 1999, with an additional thirty-one teachers from all the schools taking a similar course between January to July 2000. Progress of the teachers and their 1878 pupils was monitored.

## 3. IN-SERVICE CONTENT

Virtually all the schools had identified the development of classroom investigations as a problem area. School inspections indicated that pupils needed to be more independent to set up their own investigations, as well as to be enabled to explain their findings. Head teachers, co-ordinators, and local authority education advisors considered that teachers were reluctant to provide open-ended investigations because they lacked confidence and knowledge in science.

The 10-day course (spread over 6 months) on *Developing and Assessing Investigations* was designed to address these concerns. It covered strategies to develop open-ended investigations in the areas of electricity; melting, evaporation and dissolving, and friction. These topics were chosen as they are particularly difficult for primary teachers (Kruger & Summers, 1989; Kruger *et al.*, 1990; Webb, 1992). A constructivist approach was taken in which teachers were helped to assess their own knowledge. Then, experiences were provided to help them accept the current scientific view though active, collaborative learning using an approach outlined by Summers (1992). Tutor visits supported classroom follow-up activities.