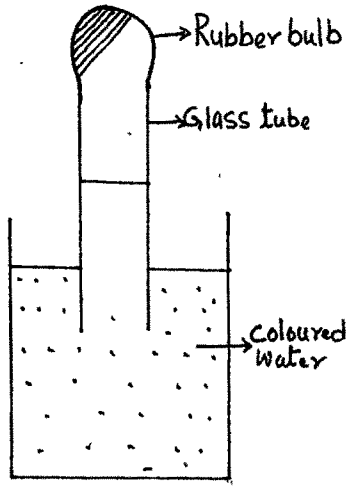
Appendix - 4

ANALYSIS OF CLASSROOM TRANSACTIONS

R. P. SHUKLA

A Science Lesson : Air-Pressure

Teacher - In this lesson we are going to have a look at two little experiments, both of which have something in common; something the same which explains what happens in each experiment. (Teacher is giving his own personal experience about the experiment, i.e. Initiation (Personal)). Let's see how well you can watch what happens and how well you can think why they happen. Here is the experiment. Watch very carefully everything that happens from beginning to end. (Teacher is giving direction, i.e., Exhortation - Encouraging pupils to raise their motivation).



(Teacher squeezes the rubber bulb at the end of the glass tube which is immersed in coloured water. Bubbles of air from the bulb and tube form at the end of the tube and rise to the surface of the water. Teacher releases pressure on bulb, and the bulb regains its original shape while water rises up the tube and into the bulb).

Teacher - Good (Praise), you all looked carefully. (Knowledge of results).

Teacher - Now, tell me what you saw happen? (Descriptive question).

Pupil - Bubbles came out at the bottom of the tube. (Closed response).

Teacher - Yes, that is correct. (Acceptance), but what happened first of all? (Closed question).

Pupil - You squeezed the tube with your fingers. (Closed response)

Teacher - Good (Praise), would you describe the bubbles more fully? (Elaborative question).

Pupil - Well, they came out one after the other and went to the top of the water in the jar. (Open response).

Teacher - I wonder where the bubbles came from? What made them form? (Open question).

Pupil - Sir I have made bubbles in my milk when blowing down the drinking straw (Initiation by pupil, giving personal experience, 'Personal').

Teacher - What is happening when you blow down, a drinking straw? (Asking about pupils own experience i.e. Personal question).

Pupil - You blow air down the straw which comes out the other end. (Initiation by pupil, giving his own personal experience).

Teacher - Well (Recognition of pupil's feelings), then what makes the bubbles when the bulb is squeezed? (Explanatory question).

Pupil - Air was pressed out of the rubber bulb into the water. (Closed response).

Teacher - Yes, that is quite correct (Praise). You are doing very well so far. (Recognition of feelings). When the bulb is pressed the air is forced out through the tube and into the water. The air then pushes on the water to make a space called a bubble. The bubble then rises to the top of the water. (Substantive). The bubble which rises to the top of water, what happens to it then? (Closed question).

Pupil - It goes into the air. (Closed response).

Teacher - Yes (Acceptance), it escapes into the air. (Elaboration). What did you observe after that? (Descriptive question).

Pupil - You took your fingers off the rubber bulb and I saw the coloured water go up the tube and into the bulb. (open response).

Teacher - What else happened? (Descriptive question).

Pupil - The water in jar got lower (Closed response).

Teacher - Yes, the water level in the jar became lower (Acceptance). Now why do you think the water went up the tube? (Explanatory question).

Pupil - I think the rubber sprang back into its original shape (Closed response).

Teacher - That is interesting (Recognition of feelings). Can you go on? (Elaborative question).

Pupil - When it was like a ball again, there was a space inside it and the water was sucked up into it. (Open response).

Teacher - That is a good idea (Praise). Let's think about it a little more (Exhortation). I wonder whether somebody could tell me why the water is sucked up? (Explanatory question).

- No reply- (Silence)

Teacher - What does sucking up? (Modified question)

- No reply - (Silence)

Teacher - Can any body help out here? (Exhortation).

- No reply - (Silence)

Teacher - Well let's think about it from a different angle. (Procedural). What is in the bulb before the water rises? (Personal).

Pupil - I reckon there is nothing in it, because you squeezed the air out of it and made bubbles with it. (Feedback).

Teacher - Yes (Acceptance), I did squeeze the air out of the bulb (Acceptance). Can you go on with the explanation? (Elaborative).

Pupil - Well, when it sprang back to its round shape which it had before you squeezed it, there was a space with nothing in it. (Open response).

Teacher - Good (Praise), can anybody tell me what we call a space with nothing in it? (Closed question).

Pupil - A void (Closed response).

Teacher - That is a good word (Praise). There is another word which is frequently used. Does anybody know it? (Closed question).

- No reply - (Silence)

Teacher - The word is used in connection with a cleaner which your mum uses for the carpets when they get dirty. (Substantive). Now can some body tell me?(Prompting).

Pupil - Vacuum (Closed response).

Teacher - That's the word. Good (Acceptance) (Praise). So when the bulb is let go and it goes back to its original shape, there is a vacuum in the bulb (Elaboration). Now what makes the water go into the vacuum? (Explanatory). A vacuum, which is nothing, can't suck things into it (Substantive). So what makes the water rise and go into the tube and bulb? (Prompting).

Pupil - I think the water is somehow pushed into the tube. (Personal).

Teacher - That is a good idea (Praise). If the water is not being pulled or sucked into the tube, may be it is being pushed into it. Let's follow that idea up a bit further. (Personal). Any ideas? (Personal question).

Pupil - The water in the jar is heavy and pushes into the tube. (Personal).

Teacher - May be (Recognition), but why does the water go up the tube? (Explanatory). If you want something to go up in the air, what do you do? (Procedural).

Pupil - Lift it up. (Closed response).

Teacher - Yes that is right (Acceptance). One way is to pull on it upwards on it. (Substantive). What does your dad do when he wants to raise his car from the ground to get at the underneath? (Personal).

Pupil - My dad uses a jack. (Personal).

Teacher - Yes (Acceptance). Tell the class what a jack is. (Descriptive).

Pupil - It is a piece of metal which you have a lever for and as you work the lever, the metal gets longer and lifts the car. (Substantive).

Teacher - Yes (Acceptance). It has two pieces which are screwed together. As the lever is moved, one piece turns round in the other piece and work upward to raise the car. (Elaboration). You are not lifting the car by pulling up, like a crane (Substantive). What is happening? (Explanatory).

Pupil - It is pushing up on the car. (Closed response).

Teacher - Yes (Acceptance). It is forcing the car up; a force is being exerted upwards on the car (Elaboration). Now let's go back to the water rising up the tube (Review). What do you think makes it rise?(Explanatory)

Pupil - There is some force which is pushing it up. (Closed response).

Teacher - Yes (Acceptance), but where is the force? (Open question).

Pupil - In the water (Closed response).

Teacher - Would you explain that a little more fully? (Elaboratory).

Pupil - Well, there is no water in the tube at the beginning but the level of the water outside in the jar is higher and so it rushes into the space. (Open response).

Teacher - That is very thoughtful (Recognition of feeling), but tell me how high the water went up into the tube? (Evaluative).

Pupil - Right up the tube and into the bulb (Closed response).

Teacher - Yes (Acceptance). So which is higher, the water in jar or the water in the tube? (Evaluative).

Pupil - The water in the tube. It went right up (Closed response).

Teacher - Well then (Acceptacne). You said that the water went into the tube because the level of the water in the jar was higher than the level of the water in the tube. But later the water in the jar, so according to this, it should finish up at the same level in both. (Elaboration). There seems to be a contradiction in what you said. (Rejection).

Pupil - Yes, I can see that now. (Knowledge of results).

Teacher - Well, do not let us give up because we are on the right track (Procedural direction). The water rises because it is forced up into the vacuum, but it is not the hight of the water that does it (Substantive).

Any other ideas where this force is? (Personal).

--No reply - (Silence).

Teacher - Well, let us leave the problem for a moment and come back to it later (Procedural). Here is something else for you to watch (Substantive). I have here a small object (A rubber suction pad is held up by the teacher) (Substantive). Will some body describe it (descriptive).

Pupil - It is made of rubber and it is sort of hollowed out one side (Open response).

Teacher - That is correct (Acceptance). Now look what I do with it (Exhortation) (Teacher presses it on the smooth blackboard, takes his hand from it and it remains fixed to the board). Tell us what you saw happen? (Descriptive).

Pupil - You pressed the rubber against the board and when you took your fingers away, it stopped on the board (open response).

Teacher - Good (Praise). Now the question is why does not it fall from the board? (Explanatory).

Pupil - Something is pushing it against the board (Closed response).

Teacher - I can't see anything pushing it (Personal). Can you? (Personal).

Pupil - No Sir. (Don't know).

Teacher - May be there is an invisible force pushing it (Personal). Has anybody been in a train when it has rushed into a tunnel (Personal).

Pupil - Yes (Closed response).

Teacher - Well (Praise), what did you notice happend to you? (Personal).

Pupil - Sir, I got a funny feeling in my ears as though something was pushing in on them. (Open response)

Teacher - Good (Praise). Now what do you think was pressing on your ears (personal).

Pupil - The air is suddenly pushed into ears. (Open response).

Teacher - Good (Praise). We are doing well (Knowledge of result). The air is suddenly forced into the ears and posses on to the ear drums (Elaboration). Something similar happens when you dive into water and the water. presses on the ear drum (Substantive). Now, go back to the rubber on the blackboard (Review). What is pushing that against the board? (Evaluative).

Pupil - The air (Closed response).

Teacher - That is it (Acceptance). The air is all around us and is pressing on things. The air surrounds the earth and goes several miles. It has weight and presses down on things. We call this 'air-pressure'. (Substantive). The force of air on things is called what? (Closed question).

Pupil - Air pressure. (Closed response).

Teacher - Good (Praise). Now let us return to the water. rising in the tube (Review). What forces the water up into the tube? (Evaluative).

Pupil - It is the air-pressure (Closed response).

Teacher - Yes (Acceptance), but where is the air-pressure? (Closed question).

Pupil - On top of the water in the jar (Closed response).

Teacher - In which direction is the air-pressure? (Open question).

Pupil - Downwards. (Closed response).

Teacher - Then what happens? (Descriptive).

Pupil - It pushes the water into the space in the tube (open response).

Teacher - That is it (Acceptance), you have got it now (Knowledge of result). Good (Praise). Would some body now tell the class, as fully as possible, what happened in the experiment and why it happened? (Elaborative).

Pupil - You squeezed the air out of the bulb and forced it out the end of the tube. Bubbles of air formed at the end of the tube and went up the water in the jar and into the air. When you let go of the bulb, the air pushing down on the water in the jar forced the water into the end of the tube and up into the bulb (Open response).

Teacher - That was very good (Praise). I think the class worked hard on this problem and had some good ideas (knowledge of result). You looked carefully at the experiments (praise) and described that I did quite well (Knowledge of result). Scientist have to be very good observers of what happens when they carry out an experiment or when they are watching things happen in nature. They also have to think a great deal to think out how one thing is connected with something else, how one thing causes another. They try to find an explanation, it build up a theory which explains many different happenings (Substantive). New lesson we will do some more experiments which involve air-pressure (Orientation).