Report on Builder Session at St Annes RC Primary School, Ormskirk
5 June 2013

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Introduction

The Builder software suite comprising *ThingBuilder* and *ScenarioBuilder* was trialled with Year 6 at St Annes Primary School Ormskirk on 5 June 2013. The children learned the vocabulary of ship structure e.g. hull, stern, bow, freeboard, draught etc. and used *ThingBuilder* to build a ship to a given design. The children then added the ship to a *ScenarioBuilder* Liverpool scenario under narrative control and finally under manual control. The morning session lasted from 9:30 am to 12:15 pm with a half hour break for play time.

Aims

The aims of the session were:

- to explore the proposition that appropriately designed 3D modelling tools can provide an engaging environment in which Year 6 children can successfully exercise and reinforce mathematical concepts and skills.

- to provide experience on which to base the design of follow-up sessions with a view to constructing a programme of sessions for Year 5 and Year 6 classes

Objectives

The objectives of the session were:

- to introduce the children to the vocabulary of the domain being modelled - in this instance building ships

- to introduce the children to use of the 3D modelling tool *ThingBuilder*

- to enable the children to build ship models approximating to a given design using appropriate mathematical methods

- to introduce the children to the use of the visualisation tool *ScenarioBuilder*

- to enable the children to place their models in a given visualisation within *ScenarioBuilder*

- to have the children control their ship's speed and heading with a practical understanding of the naval measure of heading

- in the course of the session the following mathematical concepts were to be explored:
    - estimation of fractions by eye
    - estimation of positive and negative angles,
    - estimation of positive and negative displacements from a fixed point or line
    - interpretation and modification of tables of model component attributes
    - if time permits, development of a mathematical model of the ship's behaviour as it turns (expressed in the form of a linear equation).

The session

The session consisted of 9 stages:

1. Demonstration of the Liverpool Scenario
2. The vocabulary of ships
3. Annotation of drawings of ships
4. Demonstration of building a ship with ThingBuilder

Play time

5. Children using ThingBuilder to build a ship
6. Demonstration of ScenarioBuilder
7. Children adding their ships to a scenario
8. Demonstration of manual control of a ship
9. Children manually controlling their ships in the scenario

A PowerPoint presentation (*ShipBuilder Introductory slide show June 2013.ppt*) was used on the Smart board to structure and illustrate the session.

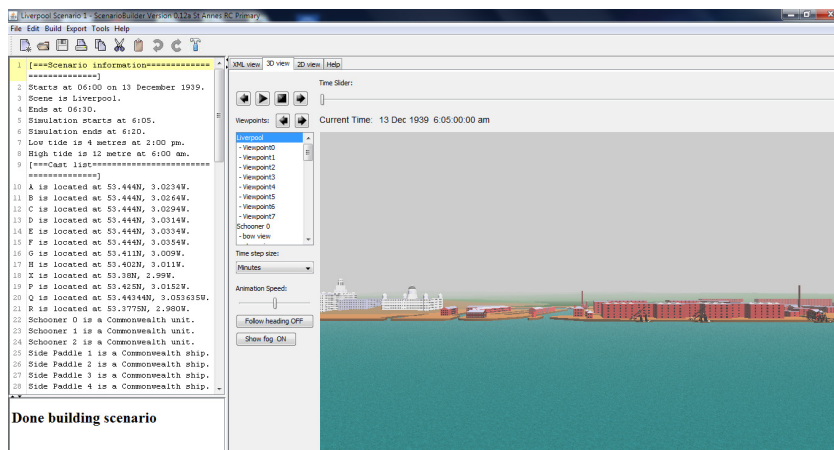## 1. Demonstration of the Liverpool Scenario

Figure 1: Liverpool Scenario

The Liverpool Scenario was opened in *ScenarioBuilder* on the classroom Smart board as shown in Figure 1. It was pointed out that the events in the 3D view were derived from the narrative in the left hand window. The narrative indicates the time and duration of the scenario, the weather and sea conditions and identifies the background scene and ships to be used and what they do. The children were told that they would be amending a much shorter narrative to sail their own ships in the scenario.

2. The vocabulary of ships

The children were then given a short session on the vocabulary of ships driven by a Powerpoint presentation (*ShipBuilder Introductory slide show June 2013.ppt*) slides 2-18. Figure 2 shows a typical slide. Terms were repeated across the slides to reinforce the learning. This approach followed that successfully applied in ChurchBuilder sessions.
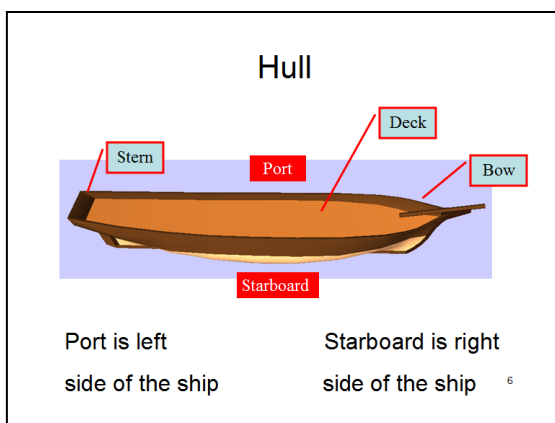

Figure 2: Ship vocabulary

3. Annotation of drawings of ships

To further reinforce the learning of the vocabulary, and to give the children a written record of the vocabulary the children completed the two pictures shown in Figure 3.
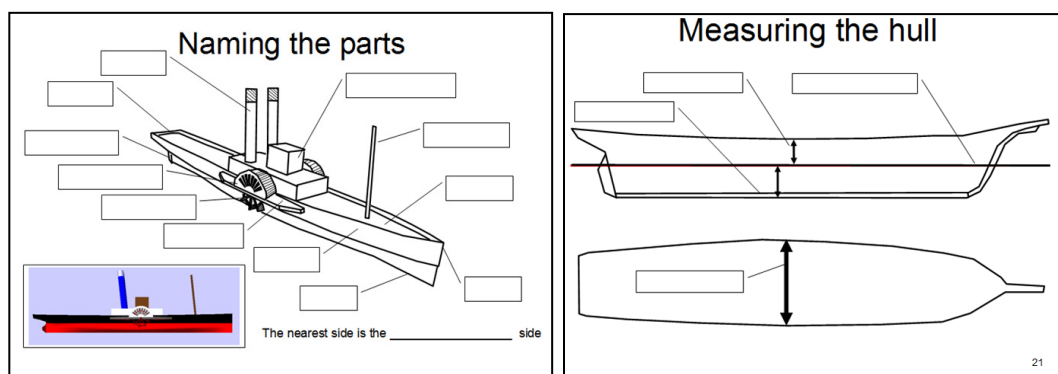

Figure 3: Naming the parts

The children generally completed these successfully in a few minutes. Misspellings were corrected and forgotten names completed with the help of staff.

4. Demonstration of building a ship with ThingBuilder

The children were then shown the building of the paddler steamer in the *Naming the parts* picture with *ThingBuilder* on the Smart board. When a new side wheeler paddle steamer is made, *ThingBuilder* looks as shown in Figure 4.
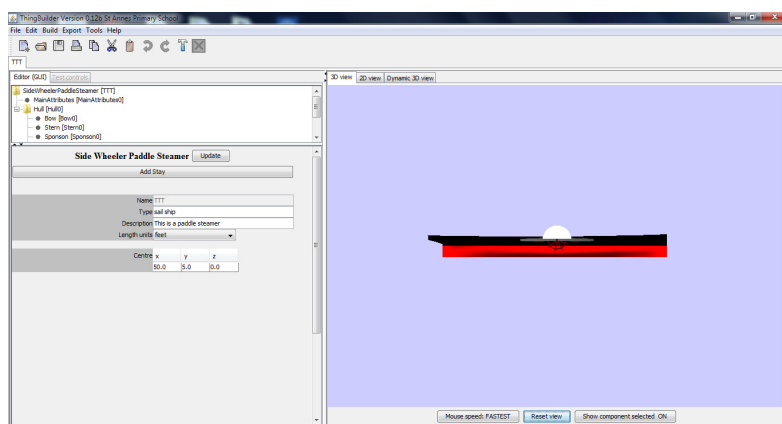

Figure 4: New side paddle steamer in ThingBuilder

The children were told that the ship was 100 feet long and asked to estimate the parameters such as offsets from the stern and centreline and lengths to use as the mast, funnels, superstructure and gaps to the wheel cover were added.

The children were being asked to judge approximate lengths to use e.g. the mast should be 80 feet from the back to look right. The diameter of the funnels should be doubled from their default values. As we went through the components their suggestions got more and more realistic.

One particularly interesting discussion took place over how to put the second funnel on the other side of the centre line. Trying smaller or larger positive numbers was seen not to work. Eventually a number of children suggested using a negative number for the offset. That worked! The rake angle of the mast was used to good effect to see

that about 10 degrees was much more realistic than the earlier suggestions of much bigger numbers. The children quickly spotted that using -10 degrees would make the mast lean forwards - as experiment confirmed. They also realised that 180 degrees would put the mast right through the bottom of the ship and 270 degrees would put it straight through the bow.

The bell then rang for playtime - 1 hour after the start.

5. Children using ThingBuilder to build a ship

After the break, the children started up *ThingBuilder* and started building their model. They were advised to make the name of their ship short since they would be repeating it several times in a narrative.

The interface seemed to cause few issues. Selecting components via the tree structure (shown in the top left of Figure 4) was not a problem for them. The few problems centred around establishing the difference between the superstructure and the superstructure sections that go to make it up.

Once the model had been customised by adding mast, funnels, superstructure the children created the dynamic model, tested the moving parts (paddle wheels and rudder) and exported it into the *ScenarioBuilder* library. Building the dynamic model and exporting was achieved by two button clicks.

Building a first ship typically took the children 10 to 15 minutes.

6. Demonstration of ScenarioBuilder

The children were shown this narrative in ScenarioBuilder on the Smart board:

```
Use scenario Liverpool Scenario 1.

XXX is a British ship.

At 06:00 XXX is at P.

At 06:18 XXX docks unassisted in Liverpool Docks at berth
Albert Dock 1.
```

It was explained that the first sentence caused the scenario they saw at the beginning of the session to be included in this scenario. The other sentences were explained.

Next, a quick model of a side paddle steamer was created in ThuingBuilder and named XXX.

The scenario was built and the children saw the ship XXX moving into the Albert Dock and berthing.

7. Children adding their ships to a scenario

The children realised at once that they could see their own ship in the scenario by opening the same scenario and replacing XXX with the name of their own ship. So they did it.

8. Demonstration of manual control of a ship

Once the children had all got their ships into the Scenario, they were told how to arrange it so that they could control the movements of their ships manually. Here is the narrative:
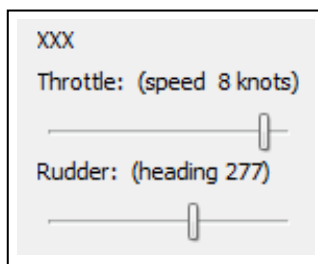
```
Use scenario Liverpool Scenario 1.

XXX is a British ship.

At 06:00 XXX is at P.

XXX is manually controlled.
```

When this narrative is built, extra controls appear on the interface as shown below in Figure 5.

Figure 5: Manual controls

A brief discussion took place on the meaning of knots.

Heading was discussed in more detail. The concept of specifying direction using degrees measured from the north clockwise was described and then reinforced with examples based on the map shown in Figure 6.
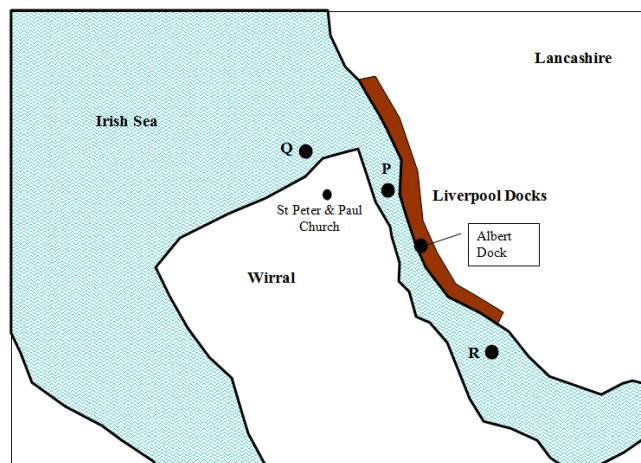
Figure 6: The scenario area

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The slideshow slides 36-38 were discussed to get the children to identify approximate headings to use to sail from P up and down the river and from Q to the mouth of the Mersey. This helped the children to navigate their own ships in the scenario.

9. Children manually controlling their ships in the scenario

The children explored sailing their own ships until the end of the session which closed at 12:15 pm.

Time did not permit the development of the mathematical model. However, the approach that would have been taken is to be found the PowerPoint slide show.

Comments and conclusions

A second session was presented to the other Year 6 class in the afternoon. This went equally well apart from two points:

- one child spotted straight away that a negative number would get the second funnel where it was wanted

- the afternoon session was not long enough to get the children to sailing their own ships without a rush and they did not have the opportunity to sail them manually.

Here are two examples of models made by the children during the session.
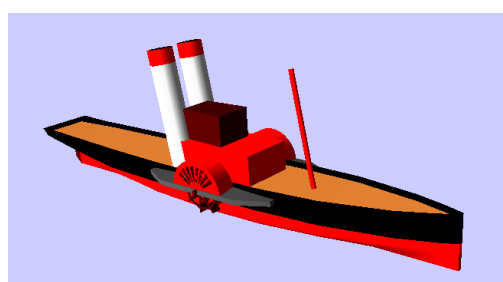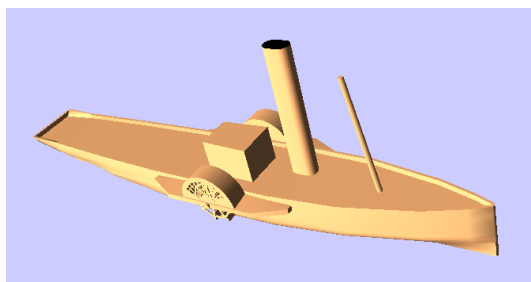
The two Year 6 teachers agreed that the sessions had been a success. The children had been fully engaged and enjoyed the session. It was agreed that the sessions should, if possible, be given in autumn to next year's two Year 6 classes. It was also agreed that each session should take place in the morning. The afternoon session is not long enough.

It was also agreed that the mathematical aspects had gone well and that shorter follow-up sessions could be devised in collaboration with the Mathematics Coordinator to address additional mathematical and other aspects during the course of the year.

Regarding other aspects, the narrative is actually a scripting language that ScenarioBuilder compiles into 3D visualisations. One class teacher suggested that teaching the children how to write their own narratives using the ScenarioBuilder narrative grammar could usefully contribute to meeting the new requirements for children learning to program at primary level.