

## **Argue-WISE learning environment: Theoretical underpinnings**

The use of Internet introduced new possibilities for applying inquiry-based activities in science. The first people that used Internet in the classroom concluded that they had to find new approaches in supporting students as they worked in small groups with this new technology (Linn, Davis & Bell, 2004). Furthermore new techniques for class instruction to account for the changes were needed. WISE was developed as an on line learning environment to scaffold teachers and learners as they were learning to take advantage of these new technologies (Cuthbert & Slotta, 2004). A learning environment is the "combination of curriculum, technology supports, and classroom activity structures orchestrated jointly by a teacher and a computer delivered program." (Linn, Davis & Bell, 2004, p.12).

Early research in KIE (which was the first form of WISE) focused mainly on improving the KIE learning environment, adding new tools or redesigning the existing tools that are integrated in the environment so as to improve learning and scaffold students in more effective ways. The first projects implemented in KIE were related to heat and temperature, a topic that was the focus in CLP (Computers as Learning Partners) project.

The Argue-WISE learning environment builds of previous research relating to WISE, argumentation and understanding of the nature of science and tries to connect all three aspects. The research questions of the current study have not been addressed before, at least not in the context of the WISE learning environment. Research in WISE and argumentation focuses mainly on constructing evidence based claims with the use of embedded scaffolds. Students' ability to construct evidence based arguments, and their ability to present those in the class was evaluated (Bell, 2004), but the nature of evidence-based claims was not investigated. Furthermore, previous research (Bell, 2004, Bell & Linn, 2000, Sandoval, 2003) emphasizes on students failure to discuss their arguments with other groups of students and reflect from those discussions in order to refine their argument. Bell (2004) and Cuthbert & Slotta (2004) argue that constructive reflective dialogues could be possible with the use of on-line discussion tools. However the combination of on-line learning tools with real time dialogues in classroom has not been the focus of research efforts, especially in terms of supporting argumentation (Clark & Sampson, 2006).

The Argue-WISE learning environment builds on previous research relating to WISE, argumentation and understanding of the nature of science and tries to connect all three aspects. Research in WISE and argumentation focuses mainly on constructing evidence based claims with the use of embedded scaffolds. Students' ability to construct evidence based arguments, and their ability to present those in the class was evaluated (Bell, 2004), but the nature of evidence-based claims was not investigated. Furthermore, previous research (Bell, 2004, Bell & Linn, 2000, Sandoval, 2003) emphasizes on students failure to discuss their arguments with other groups of students and reflect from those discussions in order to refine their argument. Bell (2004) and Cuthbert & Slotta (2004) argue that constructive reflective dialogues could be possible with the use of on-line discussion tools. However the combination of on-line learning tools with real time dialogues in classroom has not been the focus of research efforts, especially in terms of supporting argumentation (Clark & Sampson, 2006).

### **Argue-WISE: Description of the learning environment**

The content focus of Argue-WISE is a controversial issue; whether there is a need or not to protect the red squirrel in Britain. The learning environment is geared towards 11-13 year old students and invites them to construct arguments as members of different groups (farmers, government, local authorities, environmentalists), about the need or not to protect the red squirrel. Argue-WISE uses some of the embedded WISE tools (e.g. the on-line student journal, the web-board, the feedback scaffolds, the explanation constructor) to help students in their effort to develop arguments on the topics discussed in the environment.

#### *Part 1: Introduction*

##### *Description*

During the first lesson the teacher will introduce the class to the activities and the learning environment. The activities for this part of the class will be done without the use of the on line learning environment. The students will use the on line learning environment only at the end of the class to familiarize with it.

##### *Activity 1: Understanding what argumentation is*

The teacher explains to the class that for the next 3-4 science classes they will be discussing the case of the red and grey squirrel and they will use this case as a way for developing their argumentation skills.

Then the teacher asks the class what they know about argumentation and what the word reminds them of. She takes notes (in the form of brainstorming) on the board without commenting them. Then she gives the following task:

“Mr Jones has been smoking for almost 20 years. Recently he had a heart attack and the doctor suggested that he should stop smoking. His wife agrees with the doctor but he does not want to quit smoking. In your groups try to find evidence for and against smoking.”

She allows 10 minutes for this activity and then she asks three students to act as Mr Jones, Mrs Jones and the doctor and discuss the case of smoking. The rest of the class can participate in the process by asking questions.

After the end of this activity the teacher discusses with the class the process of argumentation and what parts were important in convincing each one of the persons in their story.

#### *Activity 2: Introducing WISE and Argue-WISE*

The teacher explains to the class that they will use the Internet and more specifically a tool called WISE in order to develop their argumentation skill. She assigns the students in groups of two and each group sits in front of a computer. The students are given on a piece of paper the URL for WISE and a username and password. They are asked to go to that website and follow the instruction (they have to give their names, ages etc).

After that the teacher allows 5-10 minutes of free exploration to Argue-WISE. Then she uses a projector to present to the class the following tools that they will use during Argue-WISE:

- Student journal
- Notes
- Explanation Constructor
- Web board
- Causal map

#### *Part 2: The problem*

During the second part the students enter the actual Argue-WISE learning environment and they are presented with the problem.

In this project you will debate about the need to protect or not the red squirrel after carefully examining evidence related to this topic.

You will go through a list of activities and we will need to find evidence that will support your claim. You will learn about the red and the grey squirrel and you will be presented with how different groups of people argue about the specific topic.

At the end of the project you are expected to create a poster that states whether the red squirrel should be protected or not and why.

During the last day of the class you will present your poster. Additionally you will participate in a debate, as part of a specific group, and you will be asked to argue for or against the red squirrel.

After reading the introduction the students continue to the next part of the activity. This activity presents them with the problem that the red squirrel is facing. They read information from the media (I will choose information that is appropriate, but I believe that they should have access to the real data to make the case more believable) stating the problem and the worries that different groups of people have about the red squirrel. The information presented here will be both for and against the need for protecting the red squirrel.

During this activity they are scaffolded with the *Notes* tool from WISE and with the use of questions like:

- What is the problem according to the media?
- How do you know?
- Is everyone agreeing with the problem? Are there various opinions about the problem?

### *Part 3: The red and the grey squirrel*

During the third part the students are presented with information about the red and grey squirrel. They are presented with the following types of information:

- Where they live,
- What they eat,
- Story of each one (where it came from),
- How they are presented in literature and art,

- Reproduction,
- Relation to the environment,
- Number of population for the last 100 years,
- Maps that show the population in different times,

During the exploration of this information they are scaffolded with the use of the *Notes* tool to gather information regarding the grey and the red squirrel. They are also asked to create a causal map that represents the relationship between the red and the grey squirrel and the environment.

At the end of this activity they are asked to state in a web board discussion their opinion on the following: “Should we protect the red squirrel?”. In this activity they are only stating their opinion without enough evidence to support it. Later on they will construct arguments based on evidence and at the end of the project they will compare how their opinion changed after carefully examining all available evidence.

#### *Part 4: Should we protect the red squirrel?*

In this activity the students are presented with various evidence for and against protecting the red squirrel. The evidence are presented through stories/debates of the following groups of people:

- Farmers (economic reasons, social reasons)
- Government (political reasons, Bern agreement)
- Naturalists (environmental reasons)
- Authorities of some areas in which the red squirrel is inhabiting (tourism, economic reasons, social reasons)

The students are reading through the information as they are scaffolded by the *Notes* tool in WISE. Furthermore they are using the *Explanation Construction* tool to match evidence to the two opposing claims: for and against protecting the red squirrel.

Information relating to the red list, endangered species, politics towards protecting animals will be presented through the case studies of each group of people.

#### *Part 6: Constructing the argument*

Each group of students is assigned a different role (farmers, government representative, naturalists, local authorities). They have to prepare a poster to support or not the argument for protecting the red squirrel. Their poster must be representing the group they were assigned to.

At the end of this activity they have to participate in a classroom debate. The aim of the debate is to try and reach a consensus. At the end of this activity the students are asked to reflect on the process of dialogic argumentation and explain how this is different from stating their opinion and if that has helped them in any kind of way.