Jots: Reflective Learning in Scratch

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ABSTRACT

This paper presents early work on the "Jots" system, integrated with the Scratch programming environment, which aims to help learners reflect on their learning processes. The design of the software tool and associated pedagogical strategies is presented in the context of a map of reference frames, which are levels of analysis that learners move between as they reflect. The design of a study to evaluate and further develop the system is described.

Categories and Subject Descriptors

K.3.2 [**Computers and Education**]: Computer and Information Science Education **-** *Computer science education, Self-assessment*

General Terms

Documentation, Human Factors.

Keywords

Reflection, Scratch, microblogging

1. INTRODUCTION

This paper presents work toward helping children reflect on their creative learning processes, through technological tools and pedagogical strategies. I describe the design in progress of a software system called "Jots," integrated with Scratch [4]. Scratch is a graphical programming environment designed for middle school aged children that enables them to create their own games, animations and interactive art, and share them on the web. Jotting allows children to document their learning processes as they create using Scratch. We hope that documentation through jotting, supported by an educator's careful questioning, may help students engage in rich reflection on how they learn.

1.1 Mapping Reflection

Reflection can be viewed as the synthesis of experience into knowledge and understanding (e.g. [1]), but it need not occur entirely after the experience is over. Schön's [6] concept of reflection-in-action is a continuous process by which expert practitioners move between levels of analysis of a problem, from moment to moment. I draw on the idea of reflection-in-action to map a set of reference frames that describe reflection in constructionist learning. The primary reflective activity in this

view is "frame-shifting," the fluid movement between levels of analysis of the task at hand, from narrow to broad and back (for example, moving between adding blocks to a castle and revising its design).

1.2 Reference Frames

The reference frames in constructionist learning can be mapped from narrow to broad:

- Constructing
    - e.g. building, drawing
- Setting and adjusting goals
    - e.g. deciding what to work on next
- Synthesizing process information
    - e.g. seeing patterns of frustration as I work
- Relating process to identity
    - e.g. deciding what my process says about me as a learner

1.3 Learning Goals

By gaining fluency in moving through these reference frames, learners may benefit in various ways, such as by learning to:

- Recognize the usefulness of mistakes
- Know when to seek help
- Use their own strategies to get unstuck
- Identify and respond to emotional processes
- Develop their identity as a learner
- Compare and contrast learning processes with others

2. THE JOT SYSTEM

In order to support learners reflecting as they engage in constructive learning processes, I am designing a software system and a complementary set of pedagogical strategies.

2.1 Software Tools

The jot system extends both the existing Scratch authoring application [4] and web sharing platform [5]. I have modified the Scratch application to include a collapsible pane that allows users to write a brief update about what they doing, analogous to a twitter post or facebook status update (fig. 1). I refer to these updates as jots. A menu of prompts scaffolds the writing of jots toward reflection (they include "I am thinking about", "I am excited because", "This is frustrating because", "I need help with", etc). Users can easily add emoticons to their jots. An image of the Scratch screen at that moment is automatically included with each jot, and users can optionally select a region of the screen to highlight. On the Scratch web site, a user's most recent jot appears on their "my stuff" page along with the associated screenshot. A link allows them to click through to see a history of their jots.
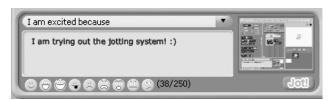
Figure 1. The Jot pane added to the Scratch user interface.

2.2 Pedagogical Strategies

To encourage reflective use of the jot tool, I am developing complementary strategies for educators. "Reflection questions" will draw on the map of reference frames above, with the aim of helping students shift between them. An educator working individually with a student would carefully choose the right moment to pose a question that suggests a shift of frame from, for example, construction to goal setting (e.g. "what are you working on now? What do you think you will try next? Maybe you could jot about that."). The questions will range across the map of reference frames. Narrower questions will focus on construction and goal-setting as the student works in Scratch. Broader questions will focus on process and identity as the student and educator look together at the student's previous jots. This questioning strategy will draw on the critical exploration method [2], allowing the students to lead the learning process, with questions mainly serving to draw to the surface the student's existing ideas. The questioning will also fade over time as appropriate, allowing the student's own questions to arise.

3. STUDY DESIGN

A study will be undertaken to further develop the jotting tool and reflective questioning strategies. Several middle school students will use the jotting system, working individually with the researcher for brief sessions, twice a week. Qualitative data collected will include screen-capture video and audio of each session, field notes, and audio recordings of summative interviews at the end of the study. The data will be analyzed using two approaches: "meaning categorization," to identify common patterns of reflective learning, and "narrative structuring" to construct stories of the pathway into reflection for each of the study participants [3].

4. FUTURE WORK

In future studies, I hope to evaluate the use of jots when they are shared online. In that context I hope to study social communication as a motivation for reflection, mentoring through the modeling of reflective thinking, and learners' comparison of their own learning processes with those of others as expressed through jots.

I also hope to experiment with making jotting more constructive by enabling "jot projects," Scratch projects that are automatically generated from a user's history of jots and screen shots, which the user could then edit into an interactive story about their learning process.

5. ACKNOWLEDGEMENTS

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