

**DIGITAL
MYSTERIES™**
by Reflective Thinking



DIGITAL MYSTERIES®

USER'S GUIDE

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Figure 1: Digital Mysteries. Collaborating around interactive tables (left), and collaborating using multiple mice connected to a PC (right)

Introduction

Digital Mysteries is a collaborative learning platform for the whole class. It promotes higher-level thinking skills and effective collaboration. It is designed for groups of 2-4 students working around interactive tabletops (Fig. 1, left) and PCs with multi-mouse (Fig.1, right).

Inspired by the paper-based *mysteries* learning tool, Digital Mysteries was created by Reflective Thinking and uses state-of-the-art technology to help teachers run better collaborative learning tasks. As a result pupils are motivated to share their thinking and enjoy solving mysteries.

From paper to digital

The educational concepts behind Digital Mysteries have been developed through years of research on technology enhanced collaborative learning. The main ideas of how to best encourage effective collaboration and higher level thinking evolved through a number of design cycles with trials conducted with school children at school.

Digital Mysteries is based on a paper based tool called *mysteries*¹. The original paper mysteries is a learning tool that aims at making evident pupils' cognitive processes through the observation and analysis of how students manipulate a set of data slips to solve a mystery. Digital Mysteries builds on paper mysteries and takes advantage of the digital functionalities in structuring the task, encouraging equitable and effective collaboration, providing tools that help students make their thinking processes visible, and supporting reflection.

The learning principles behind Digital Mysteries

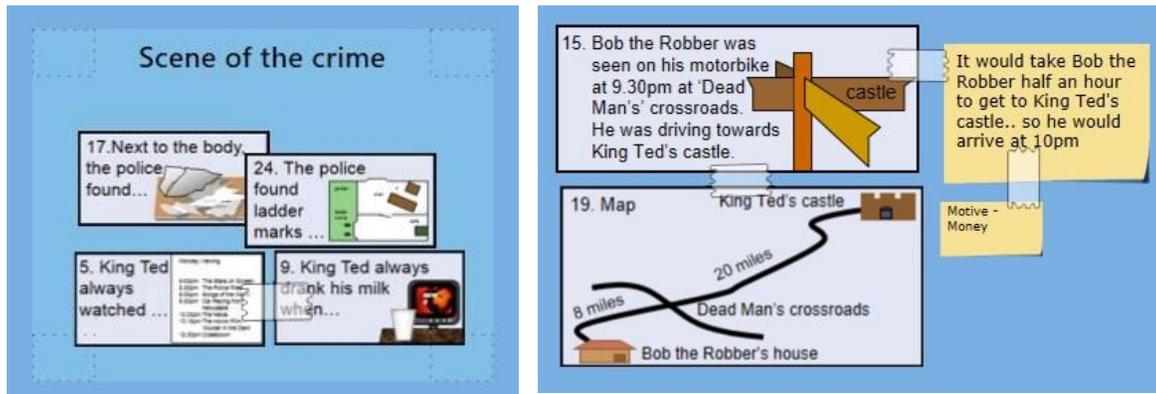


Figure 2: The named group, sticky tape, arrow sticky tape, and note tools help make the students' thinking visible

The main goal of Digital Mysteries is to promote students' higher level thinking and collaboration skills. The application encourages students to make their thinking visible on the table thus more accessible to their peers and their teachers. This is accomplished using tools such as named groups, relations (sticky tape), causal relations (arrow sticky tape), and notes (Figure 2).

A typical process of solving a mystery is divided into three stages: reading, grouping, and sequencing and webbing. While it is possible to select other configurations from the settings options, a three stage process reflects the performance of the most able students and progresses naturally in the thinking skills used as the task proceeds. Upon completing the final stage, students are asked to write down their answer. After which, the application moves into a dedicated reflection stage.

Supporting reflection is a key goal of Digital Mysteries. Reflection is supported at three levels: explicit reflective prompts that occur at stage boundaries during the task; implicit reflection support occurring as a result of group discussions; and a dedicated post-activity reflection stage.

A more detailed discussion of the educational concepts and thinking skills model used by Digital Mysteries can be found in Appendix A.

Using Digital Mysteries



Figure 3: The start-up screen

Beginning a new session

To begin a new session, and after running the application, select 'Start a new mystery session' in the start-up screen (Figure 3).

In the mystery selection dialog (Figure 4), select the mystery to solve from the list. It is possible to filter/sort according to name, subject, topic, and age group. The 'View Description' button shows a brief description of the mystery including the main question and a number of sub-questions. To start the session, select 'Begin Mystery'.

It is also possible to open a mystery from a file (not from the database), or select a folder with different multi-media files in addition to the predefined library of mysteries.

Using Mysteries as a general collaboration tool

The use of Digital Mysteries is not limited to the existing set of predefined mystery tasks. Digital Mysteries can be used as a general thinking skills/collaboration task using student or teacher prepared contents. Instead of selecting a mystery from the library, put the files you want to work with (text files, images, video and audio files) into a folder on the computer, select 'Start a new mystery session', then 'Load from file' and select the folder containing your contents. The

application will display all the existing files in that folder as slips (one slip per file). Users can manipulate these slips, group them, and create associations just like a normal mystery. The application will follow the same multi-stage configuration meaning that students will go through all the stages with a playback (reflection) stage at the end of the task. Using Digital Mysteries in this manner, as a general collaboration tool, is very useful for developing information management, planning and metacognitive skills.

For details on the use of Digital Mysteries as a general collaboration tool in addition to some sample content to work with, please follow the this link

<http://www.reflectivethinking.com/resources/?page=resources>



Figure 4: Mystery selection dialog

Users' names dialog

Before the session begins, specify the number of users and the name of each user. If users provide their email addresses (optional), a summary of the session is emailed to these addresses upon completion of that task (provided that the machine is connected to the internet).

The Digital Mystery session

The session starts with all the mystery slips randomly distributed on the screen. Each slip has three different sizes (Figure 5), a small size which shows the first few words of the information of that slip, normal and large sizes that show all the information of the slip.

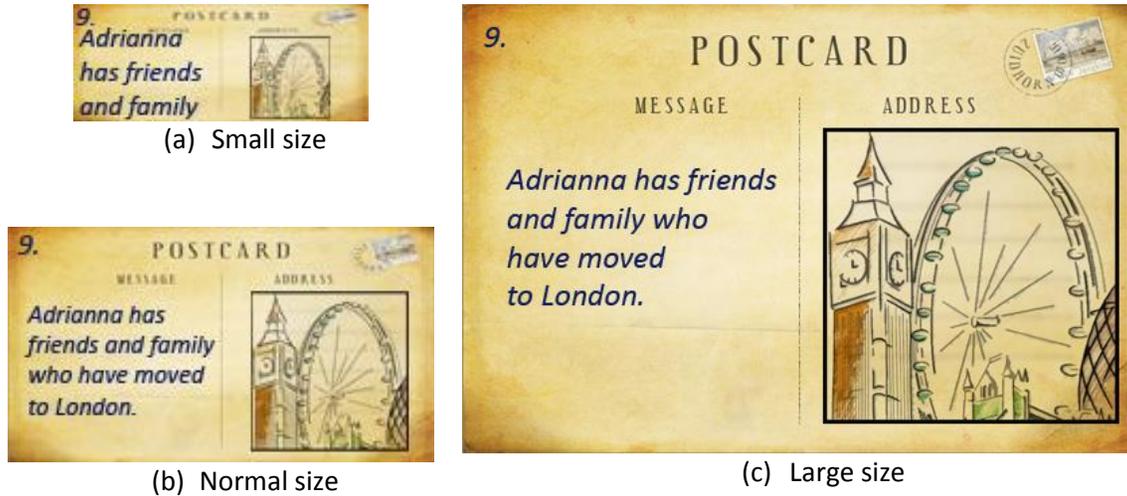


Figure 5: Each slip has three different sizes

Slips can be resized by either using two fingers (the multi-touch mode), or by a press and hold action for half a second (using finger or mouse) to show the resizing commands (Figure 6).

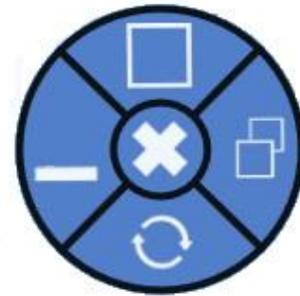


Figure 6

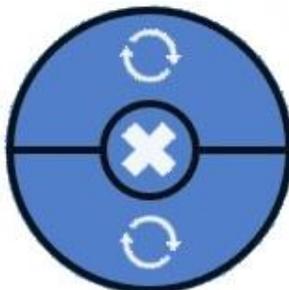


Figure 7

Slips and Sticky Tapes can be rotated by either using two fingers in multi-touch, or by a press and hold action for half a second (using finger or mouse) to show the rotate command (Figures 6 & 7).

A press and hold action on an empty part of the screen displays the commands available at the current stage. Figure 8 shows a menu with all the possible commands.



Figure 8

A quick guide to Digital Mysteries actions, commands, and dialogs

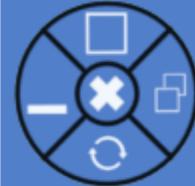
1. Press and Hold

Press and hold for half a second on a slip for resize menu, and on empty space for commands menu.



2. Resize Menu

Shows commands to shrink, enlarge, or rotate the slip.



3. Commands menu

Shows different commands depending on the current stage and selected configuration.



4. Proceed command

Moves to next stage.



5. Proceed with override

Moves to the next stage and allows for overriding existing conditions (to be used by session supervisors only).



6. Bookmark command

Bookmarks the current state (layout) as a reference point in the reflection (playback) stage.



7. More options command

Displays more commands such as next with override, save, status, and exit.



8. Exit command

Exits the current session.



9. Save command

Saves the current session. The saved session can be resumed later using the 'resume' command in the start menu.



10. Status command

Shows a quick status that includes progress, participation charts (when possible) and created groups and notes.



11. Group command

Creates a new named group.



12. Note command

Creates a note to record any thought or useful piece of information. You can link notes to slips using the sticky tape.



13.Relation command

Creates a sticky tape that can be used to indicate relation between strongly related slips. Just place the tape over the slips to be associated.

**14.Causal relation command**

Creates an arrow shaped sticky tape. Use this tape to indicate causal relations or time sequences.

**15.Participation**

Shows the participation levels of the users (when possible). It doubles in size when participation is highly unequal.

**16.Progress**

Shows the progress of the current session. It displays the current stage, the proportion of time spent at each stage, any attempts to change stage prematurely and any bookmarks or overrides used.

**17.Override mark**

Indicates that the override feature has been used. The number of marks equals the number of overrides.

**18. Status Report**

- The information at the top shows the Configuration (top left) and Difficulty level (top right) for this session.
- The bar beneath shows the duration at each stage with markers for bookmarks, feedback, or use of the override feature.
- The participation charts shows the level of participation at each stage (when possible – dependent on the technology used).
- The groups list shows all the created groups with the number of slips in each
- The notes list shows all the created notes.



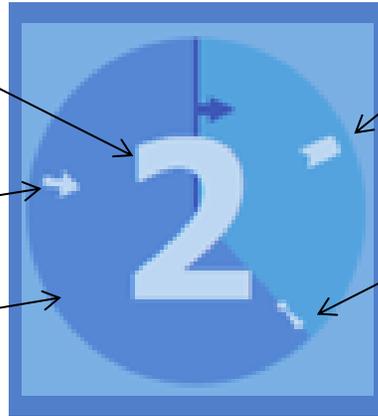
Progress chart

As seen on help slip 16, Figure 9 is the progress chart, which shows the progress of the current session:

The current stage is made clear by the number in the middle

Shows any attempts to move to the next stage prematurely

Each segment of colour signifies the proportion of time spent at each stage



Shows where any bookmarks have been used

Highlights any overrides

(Figure 9)

The final sequencing and webbing stage

The goal of the sequencing and webbing stage is to encourage the students to use higher level thinking skills and understand the causal relations and time sequences presented in the slips. The students at this stage should start to formulate an answer to the question and lay the slips out on the table in a way that mirrors their understanding of the problem, representing a good justification of their answer. The students should use the arrow shaped sticky tape to represent causal relations and time sequences and the normal sticky tape to represent normal relations.

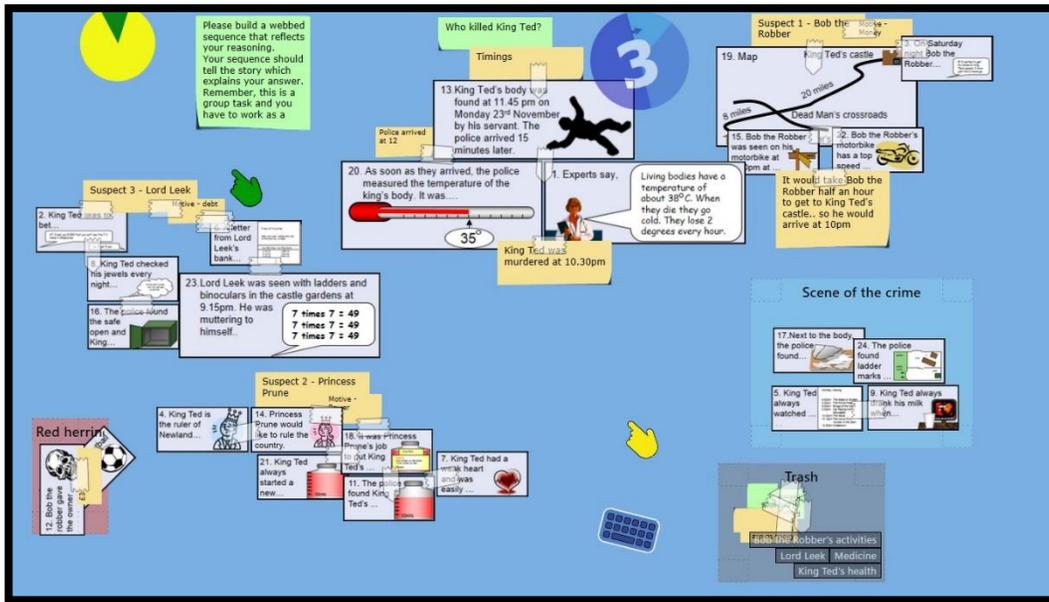


Figure 10: A mystery at the final stage. Some slips are still in groups, but a webbed sequence is beginning to form that uses both type of tapes to clearly distinguish between the different types of relations between the slips.

Upon indicating the completion of the stage, the sequence evaluation dialog (Figure 11) appears. This dialog encourages the students to assess their layout themselves and compare it to a set of options. Feedback is provided to help users move to the more expressive webbed sequence layout.

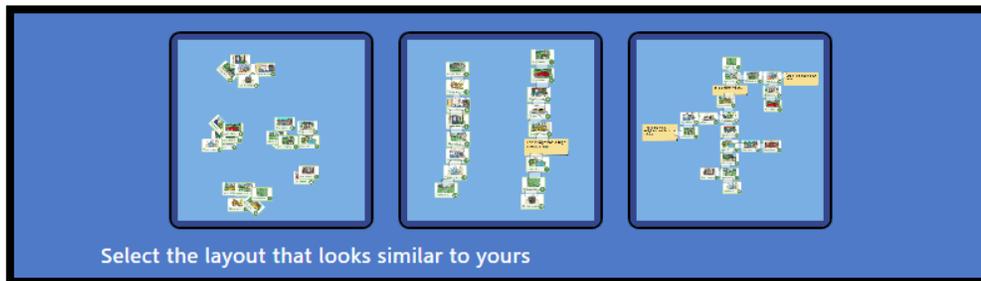


Figure 11: Sequence evaluation dialog

Writing the answer

Upon successfully laying out the slips in a webbed sequenced manner, the application shows the answer dialog. Students are expected to write down an elaborated answer which is reflected by the layout of the slips in the sequencing and webbing stage. After writing the answer, the application moves to the reflection stage.

The reflection stage

The reflection stage is controlled using a reflection dialog. The reflection dialog (Figure 12) is designed to provide a simple, static visualization of the whole session. It contains the following elements/controls:

- The bar at the top shows the duration at each stage with markers for bookmarks, feedback, or use of the override feature.
- The images show captures at the beginning of the session and at the end of each stage.
- A slider that makes it possible to move the player to any point in time.
- The play/pause buttons control the player.
- The up/down buttons control the speed of the playback.

Clicking on any of the images or markers on the progress bar moves the player to that point in time. Moreover, it is still possible to manipulate the slips when playback is paused, allowing for an interactive playback where teachers can discuss students' decisions and different possible scenarios throughout the process.



Figure 12: the reflection dialog

Settings and allowing for differentiation

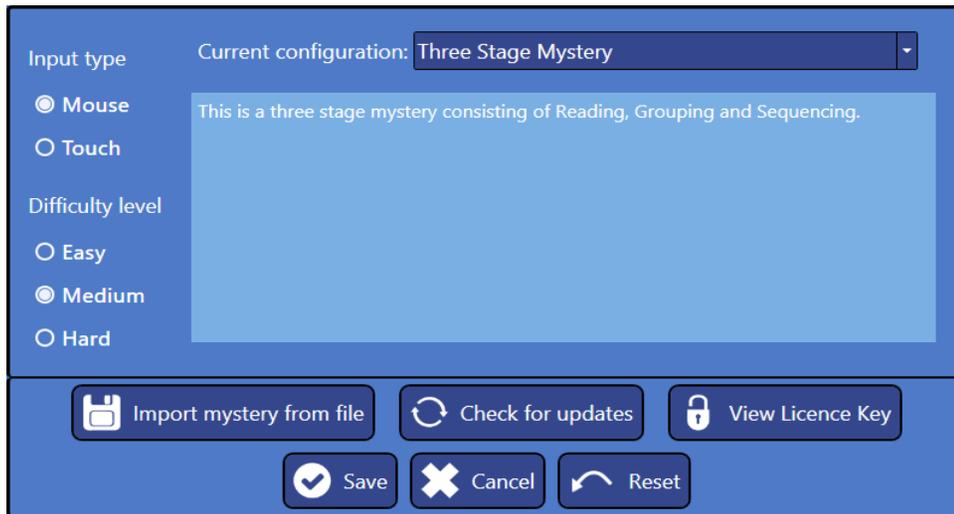


Figure 13: Application settings

Selecting 'Settings' in the start-up screen displays the settings dialog (Figure 13). The settings dialog allows for: changing the input type used, the difficulty level of the mystery, the configuration to use, adding new mysteries to the database, and displaying the licence key.

- **Import mystery from file:** Adds new mysteries (downloaded from the website or created using the Authoring Tool) into the mysteries database.
- **Check for updates:** Checks for any new updates for the application.
- **View licence key:** Displays the current licence key and allows for input of a new license key.
- **Save:** Saves the selected difficulty level and configuration to be used in new sessions and returns to the start-up screen.
- **Cancel:** Cancels the changes to the difficulty level and the configuration and returns to the start-up screen.
- **Reset:** Returns the difficulty level and the configuration to the default application setting.

Mystery levels and differentiation

Each mystery supports three different levels. Changing the level changes the number of information slips for the mystery with the most advanced level showing a larger number of slips containing more abstract information. The main question and support hints may change with different difficulty levels depending on how the teachers designed each mystery. This enables the teachers to give the same task to the whole classroom, yet allow for differentiation among

groups by selecting different difficulty levels for them depending on their achievement levels. When displaying the mystery information in the new mystery session dialog, the mystery information related to the selected difficulty level is displayed.

Changing input type

The default input type for Digital Mysteries is multi-mouse. To change to a touch screen interface, simply select Touch in the input type options found within the Settings menu.

Mystery configurations

The default mystery configuration uses three stages (reading, grouping, and sequencing and webbing) with different tools for each stage. It is also possible to select from a set of predefined configurations, or use custom configurations created using the Configuration Tool.

Saving and Resuming

Digital Mysteries allows for resuming saved sessions, or playing back (using the reflection stage) previously completed sessions. To save the current status of a session, show the commands menu (press and hold for half a second on an empty space on the screen), select the 'more options' command, then select 'save' and enter a name for the session. The session will be saved in a 'Logs' folder under 'My Documents\Reflective Thinking\Digital Mysteries'. To resume the session, select 'Resume a previous session' in the start-up screen and select the session to resume.

Recovering from accidental session termination

If a session has been accidentally ended for any reason (e.g. due to power failure), it is still possible to resume the session. All sessions are automatically saved in 'Logs' folder under 'My Documents\Reflective Thinking\Digital Mysteries' using a file name that is identified by the name of the users, the mystery, and the time of the session. To resume the lost session, select 'Resume a previous session' and look for the session based on the name of the users, the mystery, and the date. It is then possible to resume the session.

Playing back sessions

To run the reflection stage on a previously completed session, select the 'Playback previous session' command from the start-up screen. All sessions are saved in a 'Logs' folder under 'My Documents\Reflective Thinking\Digital Mysteries'. Sessions are named based on the names of the users, the mystery, and the date of the session.

System requirements

Digital Mysteries supports collaboration either using PCs with multi-mouse or interactive tabletops. Some tabletop technologies may require different installers depending on the technology used.

The system requirements are:

- Operating Systems: Windows Vista, Windows 7, or Windows 8.
- Hardware: 2GB of RAM and 300MB of hard drive space.
- To utilize the multi-touch features a multi-touch screen is required.
- To utilize the multi-mouse feature you need more than one mouse (up to 4) connected to the PC.

When connecting multiple mice to a PC, and when not using Digital Mysteries, all mice will control the single mouse pointer used by the system. However, with Digital Mysteries, each mouse will control a separate pointer. The maximum number of users on a Digital Mysteries session depends on the number of mice connected to the PC when the application starts.

Note: Do not unplug, or plug mice to the PC during the session.

Registering Digital Mysteries

Upon first installing Digital Mysteries, the application runs in a trial mode for 28 days. Upon purchasing the application, you will be sent a registration key. Once you receive the registration key, you need to copy it, run Digital Mysteries, select 'Register', and paste the registration key where indicated. Please note that your machine must be connected to the internet to be able to validate the registration key.

After successfully registering the product, you need to make sure that the application is connected to the internet once a month for the purpose of verifying the validity of the licence key. The verification process is done in the background when the application is run with an internet connection present.

Need help?

If you have any questions or require any further information please contact us directly either by sending an email to info@reflectivethinking.com, or through the 'contact us' page at <http://www.reflectivethinking.com/contact>

Appendix A – Digital Mysteries and thinking skills model

The main goal of Digital Mysteries is to promote students' higher level thinking and collaboration skills. The application encourages students to make their thinking visible on the table and thus more accessible to their peers and their teachers. This is accomplished using tools such as named groups, relations (sticky tape), causal relations (arrow sticky tape), and notesⁱⁱ (Figure 2). Such 'externalization' tools trigger and encourage task-related group activities such as discussions and disagreements that increase the probability of useful learning mechanisms to occur (e.g. grounding, knowledge elicitation, internalization, and reduced cognitive load).

From observing higher achieving students doing mysteries, three main stages were identified in how the majority of students tackle mysteries: reading, grouping, and sequencing and webbing. Less able students may skip or combine stages. Consequently, a typical process of solving a mystery in Digital Mysteries is explicitly divided into three stages to guide students of all abilities through the same process. While it is possible to select different configurations from the settings options, the three stage process is selected as default since it firstly reflects the performance of the most able students and secondly progresses naturally in the thinking skills used as the task proceeds.

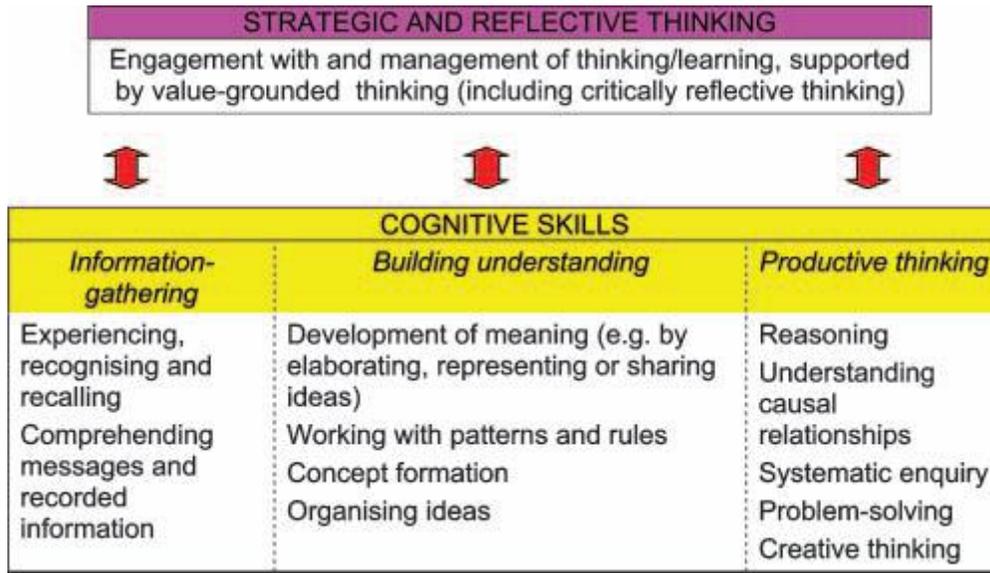
The default three stage-structure also maps exactly to Moseley'sⁱⁱⁱ well-established model for understanding thinking and learning (Figure 14). While the first reading stage targets the basic skills of information gathering, the other stages utilize higher level skills. During the grouping stage, through trying to put slips together in 'named' groups and link tightly related slips using the sticky tape, students start to form an understanding of the mystery and use skills such as organizing ideas and concept formation. At the final sequencing and webbing stage, the students are expected to lay the slips out in a manner that represents their understanding of the problem and reflects/justifies their answer to the question. In doing so, students utilize skills such as reasoning and understanding causal relationships. Upon completing the third stage, students are asked to write down their answer. After writing their answer, the application moves into a dedicated reflection stage.

Supporting reflection is a key goal of Digital Mysteries^{iv}. Reflection is supported at three levels: explicit reflective prompts that occur at stage boundaries during the task; implicit reflection support occurring as a result of group discussions; and a dedicated post-activity reflection stage that allows for an abstracted replay of the full session with some static visualization of the most prominent elements of the process.

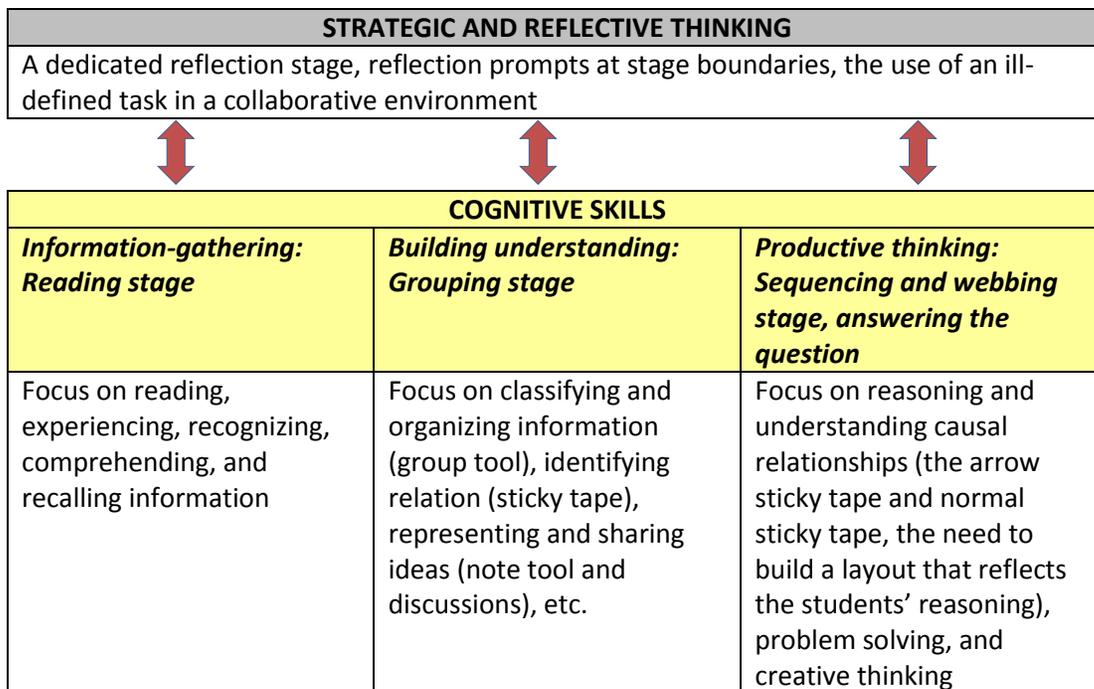
With regards to encouraging effective collaboration, and in addition to the externalization tools which aim to trigger discussions, the application switches from multiple input during normal slip

manipulation, to single input at key decision points (e.g. naming groups) to increase the probability of useful discussions occurring around such actions. Moreover, in the multi-mouse version where users can be identified, the application shows participation levels of the students as a pie chart on the screen to increase their awareness (and the teacher's awareness) of the contribution of each student.

As tasks that are designed to be run in a classroom with a number of groups working at the same time, an adequate level of scaffolding is provided to the students depending on the students' performance levels. This aims at reducing the load on the teachers, turning their role into that of facilitators and thus enabling them to supervise a number of groups at the same time.



(a) Moseley et al.'s (2005) integrated model for understanding thinking and learning



(b) Digital Mysteries three-stage structure and its mapping to Moseley's thinking skills model

Figure 14: Digital Mysteries thinking skills model

ⁱ Leat, D., and Nichols, A. (2000) Diagnostic and formative assessment through observation. *Assessment in Education: Principles, Policy & Practice*. Vol. 7, Iss. 1.

ⁱⁱ Kharrufa, A., Leat, D., Olivier, P. (2010) Digital Mysteries: Designing for Learning at the Tabletop. *The Proceedings of the ACM International Conference on Interactive Tabletops and Surfaces*. ITS'10.

ⁱⁱⁱ Moseley, D., Elliott, J., Gregson, M., and Higgins, S. (2005) Thinking skills frameworks for use in education and training. *British Educational Research Journal*, pages 367–390, 2005.

^{iv} Kharrufa, A., Olivier, P., Leat, D. (2010) Learning through reflection at the tabletop: A case study with Digital Mysteries. In *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications*, pages 65-674, 2010.