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Extended App Review: **Digital Mysteries: Marble Land** (Computing/Maths)

Published by: **Reflective Thinking**

Education level: **Primary (KS2)**

Price: **€1.99** Platform: iPad/iPhone (iOS7+)

Version: **3.3** Last Updated: **April 2015**

App store reference URL:

<https://itunes.apple.com/us/app/digital-mysteries-marble-land-computing-maths/id962725007?mt=8>

This review was completed at Dublin City University during the development of the MICOOL App Rubric. For more information about MICOOL, the rubric, and for a range of shorter-form app reviews, please visit www.micool.org

Review Date: **24 April 2016**

Rubric Score: **47: (69, 38, 16, 64)**

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1. Introduction

This review makes use of the MICOOL App Rubric¹. The evaluation was performed collaboratively by the four reviewers named on the opening page on the 3rd of November 2016. The MICOOL rubric examines four thematic areas: content, design, assessment and technical quality in order to determine whether the app is suitable for classroom or collaborative learning environments. The rubric is designed to remove subjectivity from the review process. However, it must be acknowledged that this review is limited by its reviewers lack of familiarity with the app's target demographic. Consequently it is recommended that this review is considered introductory.

1.1 The evaluated app

The evaluated app is 'Digital Mysteries: Marble land'. Marble land is an iPad app, which involves students working in pairs to solve a three-stage mystery. The first stage involves a reading component, the second involves following an ordered set of instructions and the third is a reflection stage. The aim of the app is to introduce students to computing topics, specifically sequences, selections and variables. It does so by drawing a parallel between solving a treasure hunt and the way a computer program works. Maths and reading skills are also reinforced. Marble land is aimed at children between the ages of 7-11. It is designed to cover topics from key stage 2 computing curriculums.

2. Instructional content

The core objective of the app is to introduce children to the concepts of sequencing, variables and selections. It achieves this by teaching through analogy. There are three stages to the game. In the first stage, users are presented with twenty slips of information and are asked to read them all. The slips are the basis of a treasure hunt. In the second stage the children choose one of three characters and move through the

¹ MICOOL app rubric. Available: <https://docs.google.com/a/mail.dcu.ie/forms/d/e/1FAIpQLSdW8adKe4FXUrM54fwHSrAs2xsw8ks5zz3DHm50oqmLMmGWWg/viewform> Accessed 03 November 2017

treasure hunt. The third stage asks the children to reflect on the reasoning behind their solution to the problem.

Each character begins the game with a different number of marbles, meaning that the sequence they will follow to complete the treasure hunt will be different. As they move through the treasure hunt users gain and lose marbles. In order to find the treasure they must have correctly kept track of how many marbles they have. If at any point they realise they have the wrong number of marbles, they must go back over their work slip by slip and “debug” their work. The parallel provides an age-appropriate introduction to computing concepts. The content relates to the stated aims of national computing curriculums for the age group the app is aimed at².

A ‘teaching with mysteries’ section provides teachers with instructions for using the app as well as a detailed description of its teaching objectives (See Fig 2.1). It is quite thorough. It links each section of the game to its stated educational objectives. However, it lacks any information relating to the subject it is teaching, computing. Although computing concepts are clearly introduced in the game by the parallel it makes, the teacher must explain them without being provided with information on the subject. Links to other sources of information aren’t offered either. Consequently it is quite limited in scope.

Scope is a major problem for app. Playthrough time is quite quick and the lessons learned do not seem proportional to the relatively significant amount of time that must be invested by the teacher into preparation and explanation.

² Example of computing curriculum. Available at:

http://www.computingatschool.org.uk/data/uploads/primary_national_curriculum_-_computing.pdf

Accessed 09 November 2016

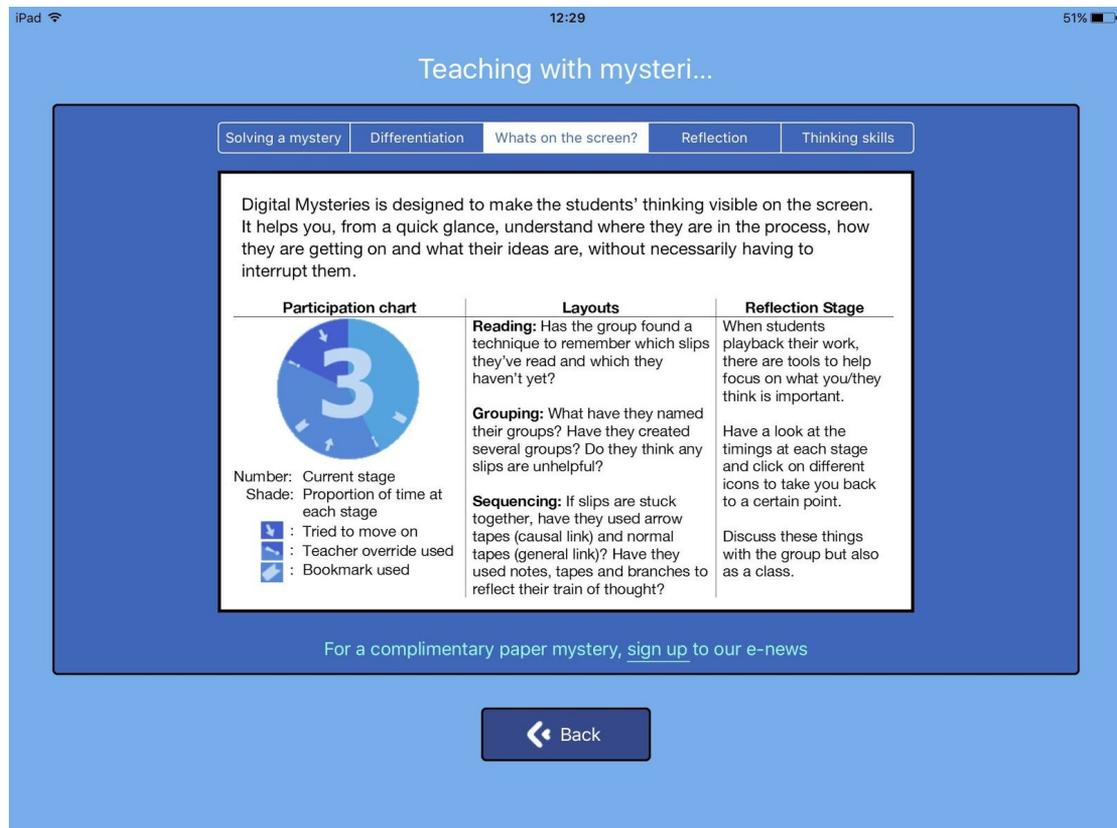


Figure 2.1 - Evaluated app's teaching instructions

3. Instructional design

The three stages of the app's treasure hunt game are played on a single game screen. Navigation is intuitive and is suitably simple. Instructions are provided in green textboxes, which are fixed on the game screen (see fig. 3.1).

In stage one, users are tasked with reading twenty information slips. To read the slips they pinch-out to expand them. Slips can be moved around the game screen and more than one can be opened at a time, encouraging collaboration and making use of the iPad's large screen. They can also be stuck together using a sticky tape tool. Users can press a question mark in the bottom left corner for information about the stage they are on. When the task is finished, they access a menu button in the top left corner and press 'next stage' to progress.

Progression is not immediately apparent. The same slips from stage one are used to complete the treasure hunt in stage two. The instructions in the green textboxes

change, although attention is not drawn to this and it is not obvious. The only other change on screen is the number one in the top right corner becoming a two. There is no satisfaction in completing the stages and there is no sense of progression through the game. The reading from stage one is repeated in stage two, rendering stage one a tedious prerequisite to stage two's much more engaging treasure hunt. It is the same case progressing from stage two to stage three, the reflection stage.

Confusion may arise from the use of language within the app. Users are asked to add and subtract marbles which are alternately referred to as 'marbles' and 'shiny marbles'. It is not obvious whether the use of the word shiny is merely descriptive or whether it denotes a different category of marble which must be accounted for separately.

As previously mentioned, instructional screens for teachers can be accessed from the main menu. They are largely text-based and simple in design, which is appropriate in that context.

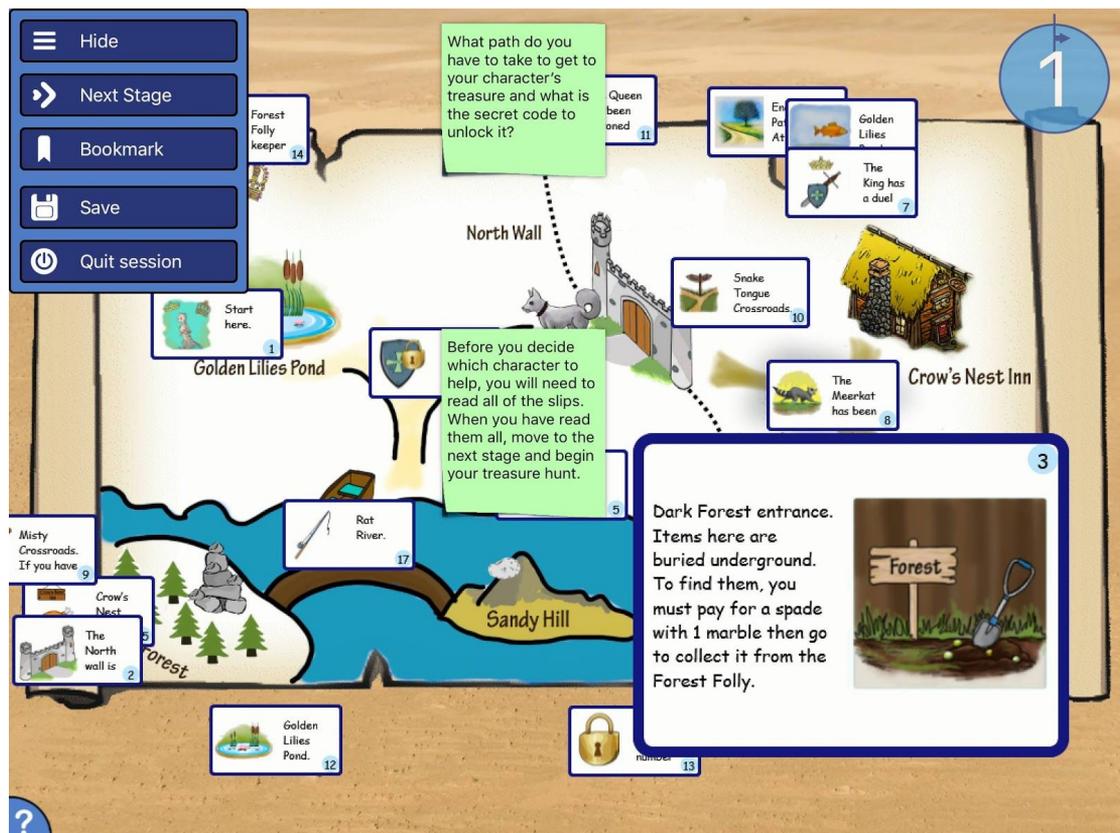


Figure 3.1 - Evaluated App's game screen

4. Assessment

The app provides very few tools for checking understanding and performing assessment. It relies heavily on teacher intervention and supervision.

There is an issue with progression between the second and third stage of the app. To advance from stage two the user must enter a code, revealed by completing the stage. However, the user will progress to the third stage regardless of whether or not they have submitted the correct code. Furthermore the user is not alerted to whether their answer is right or wrong. The answer must be checked by the teacher.

The final stage of the app is a reflective stage. At this point the user can watch a screen recording of their session and reflect on how they solved the treasure hunt. While this can help with formative assessment, it relies entirely on a teacher to identify what students have done right or wrong and explain what can be learned from this.

A report is provided by the app at the end of the session, which includes information such as the date, the participants' names, and their answer. This report can be accessed by both the student and the teacher. However, once more, the report provides no feedback on what was done right or wrong. Overall the app does very little to assess learning and provide engaging feedback for the user.

5. Usability

As previously discussed, the app relies entirely on the guidance of a teacher. As a result, the app may be confusing to independent learners in the publisher's stated age category. Teacher intervention is crucial to explain what is happening and how each section works, before guiding the students through the learning process. Without the presence of a teacher the objectives and learning outcomes are unclear.

The app provides a save function to allow users to save their progress and exit to the main menu. However, if the user exits the app their progress is lost. This may not be problematic as the app does not take long to complete.

The user progresses through the three stages of the game linearly with the guide of a teacher. The app requires the user to complete one stage before they can move onto the next. For example the user cannot progress to stage two unless they have read all the information in stage one. The app provides a teacher override button to allow the teacher to skip a stage if necessary.

The app demonstrates no consideration to learners with certain disabilities. The app may not be accessible to learners with dyslexia as the majority of the app is text based.

6. Direction and Support

Within the app there are sections available to the teacher that provide a source of help and instruction for implementation. These sections can be easily accessed from the main menu. The first of these sections provides basic information about the app including the intended age group and the questions teachers should be posing to their students while progressing through the app. This page also provides an in-depth description of how the app should be used and how it works. The second section details the different stages the learner will go through and how the teacher can understand where they are in the process at a quick glance. Rudimentary tips are offered to the user via an in-game help icon. They cover the basic functionality of the game.

External support is available on the developer's website³. This includes frequently asked questions on both the teaching and technical aspects of the app. The developers also provide a series of how-to videos on getting the most out of the app and how to use features on the iPad for those who may be unfamiliar. The developer's site does not provide any support or direction for learners attempting to use the app independently. There is also the option of contacting the developers directly with

³Help section of developers website available at: <http://www.reflectivethinking.com/faq>

specific concerns through a contact page on their website or through their social media.

7. Mediation

The app is quite limited in its use of media resources. Instructions are entirely text-based. The game itself is also text-based, although some supporting images are used. Sound is not implemented at all. This is quite unsatisfactory. There are several areas of the game that could have been improved by the inclusion of audio, such as reinforcement and accessibility.

Upon completion of the game, users are presented with a screen recording of their progress through the three stages. Basic video functions are included: users can play, pause, fast-forward and rewind. A fast play feature is also provided for quick reviewing of users' progress.

The look of the app is quite simplistic. The menu system is blue in keeping with other *Digital Mystery* apps. The game screen consists of a muted brown map. There are pictures on the map, which help users to navigate the story visually. The pictures relate to places described in the scrolls used during the treasure hunt. They also appear on the scrolls. The pictures are simplistic, easily understood and age-appropriate. The chosen font is suitable and legible.

Two option icons are present during play. The icon on the top left is the menu and the icon on the bottom left is the help. The colour of the icons keeps with the overall blue theme within the app. They follow standard conventions for recognition, the menu icon consists of three horizontal bars, while the help icon is a question mark.

8. Technical Quality

Downloading and installing the app from the App Store is straightforward. It is 14.4mb in size. Considering the limited scope of the app, the quick playthrough time and the fact that several copies would be required for a classroom, the app is quite expensive at €1.99. It is only available on iPad.

The app is a standalone piece of software; no additional downloads or purchases are required to run it. Additionally there are no external requirements such as an Internet connection or e-mail logins.

Generally the app ran smoothly in testing, although one issue was discovered. Attempting to change the difficulty level of the app in the settings menu consistently caused the app to crash.

9. Motivation & Engagement

Engagement varies across the different stages of the app. In stage one, there is no apparent value in reading through the slips from a user's perspective. Without the treasure hunt component to engage with, the content on the slips is chaotic and meaningless. The motivating factor in stage one is simply the user's presumed desire to reach stage two. However, the tedious nature of the task renders this an uninspiring stimulus. Completion of the task is self-reported, making it easily skipped. It is also unsatisfactory to complete. Nothing on-screen changes with the exception of the number indicating that you have moved from stage one to stage two.

Stage two is much more engaging. The user chooses a character, which gives them a starting point among the slips. They then follow the instructions on the slip and begin moving through the treasure hunt, adding and subtracting marbles as they go. There is a clear goal here - to solve the treasure hunt. The incentive makes moving through the slips fun and engaging. Once again however, completion is unsatisfactory. As mentioned earlier, users finish this stage by entering the number of marbles they think they are supposed to have. They progress regardless of their answer and are given no feedback from the app to indicate how they have done.

There are three characters to choose from and upon completion of stage two users are encouraged to solve the mystery again using one of the other characters. However, given the anti-climatic nature of the treasure hunt, users may not find repeating the process as engaging as they might have the first time.

The difficulty of the game can be changed. There are three settings, easy, medium and hard, with medium being the default. In testing it was found that attempting to change the difficulty made the app crash. According to the publisher, when a user selects easy mode an extra hint will appear in the second stage, while the difficult setting adds three more slips to the treasure hunt.

The app provides users with feedback in the form of a screen recording and a report, which can be printed and shared. Feedback is poor and offers no insight into user performance. The report once again mentions the user's final answer but gives no indication of its accuracy. It also lists the slips the user read in the process of completing stage two.

The app does not patronise the user. The in-game instructions and the level of maths that must be performed are age-appropriate.

10. Theoretical Basis for approach to teaching/ learning

The app takes a constructivist approach to learning. Constructivism focuses on mental processes to impart understanding. The game is analogous to the way a computer program works. Children are either told this beforehand or it is revealed to them afterwards. They must consider the comparison in order to gain understanding. The problem solving component in stage two of the app promotes understanding by asking students to play the role of a computer program. They learn about sequencing because each step must be taken in a particular order, just as they must take each slip in order. The slips present them with two options based on how many marbles they think they have. They proceed based on their answer, thereby learning about selections. They learn about variables by storing information about the ever changing amount of marbles they have. The reading component is an incidental benefit of the app.

The app's structure is based on Moseley et al.'s (2005) integrated model for understanding thinking and learning⁴. There are three parts to the framework: description and intended use, evaluation and summary. These are clearly reflected in the app's three stages.

Although the app's content is based on computing curriculum topics, it is not affiliated with any particular national curriculum. Nor is it endorsed by any independent educational authority. Nonetheless the app's content is objective.

11. Conclusions

Overall, Digital Mysteries Marble Land does well in providing content suitable to its target demographic but is hindered by its reliance on teacher guidance. While it utilises a strong theoretical framework, it is limited in scope. The app does not make use of the available technologies provided by the iPad and does little new or innovative to engage its audience. It may not be suitable to large classroom environments as a teacher would be required to oversee every individual session in order to guide students.

11.1 Score Breakdown

Using the MICOOL App Rubric each thematic section is given a percentage. The app's overall score is derived as a percentage calculated as the mean of these four sections.

A score of 69% was recorded for instruction. The app's instructional content is presented clearly and for the most part is suitable for the intended demographic. The information presented is consistent and reliable. However, learning outcomes may not be clear to individual learners.

⁴Moseley et al.'s integrated model for understanding thinking and learning. Available: https://books.google.ie/books?hl=en&lr=&id=s1D2IXoNZjwC&oi=fnd&pg=PP1&dq=moseley+et+al+2005+integrated+model+for+understanding+thinking+and+learning&ots=9p335vd0l_&sig=s-vLMMmZZWPm2SdK2SeEdMqhK0g&redir_esc=y#v=onepage&q=moseley%20et%20al%202005%20integrated%20model%20for%20understanding%20thinking%20and%20learning&f=false
Accessed 07 November 2016

A score of 38% was recorded for design. The app scored poorly in this section due to the app's limited use of available media technologies and its poor checking procedures and feedback. The app appears to give little consideration to users with disabilities, particularly dyslexia.

A score of 16% was recorded for assessment. This was due to the app's total lack of feedback to the user. Assessment completely relied on the teacher's input and reflection on the part of the learner.

A score of 64% was recorded for technical. The app scored relatively well in this section due to its ease of use and reliability. The app was easy to install and ran reliably throughout the different stages.

Taking these scores into consideration the app's overall score was recorded as 47%.
(47(69,38,16,64)).