

# Foreword

Lero – the Irish Software Engineering Research Centre runs an Education and Outreach Programme. The goal of this programme is to promote computer science and software engineering in the education sector. In particular we target second-level students. We ran an outreach pilot project in three secondary schools for 210 students from October 2007-May 2008. We introduced the Scratch tool that teaches programming concepts to teachers and students. This tool was developed by Lifelong Kindergarten group at the MIT Media Lab and is freely available. Because the teachers and students involved in the pilot project were very enthusiastic about the pilot and eager to learn more, we decided to build a more comprehensive set of materials. With the help of Sean Baker of Iona Technologies, we established links with IT Tallaght and CIO Ireland. IT Tallaght has also run Scratch workshops for transition year students; CIO Ireland is interested in promoting ICT as an exciting career opportunity.

Two secondary school teachers spent the summer of 2008 working at Lero as part of the Science Foundation Ireland Secondary Teachers Assistant Researcher (STARs) program. Muireann O'Brien from Carrigaline Community School, Co. Cork and Brendan O' Sullivan from Castletroy College, Co. Limerick applied their knowledge and expertise of teaching ICT at second-level to developing a first version of a transition unit for transition year students. Transition units (TUs) are one of the new curriculum components in the post-primary education senior cycle. The goal of this curriculum is to teach basic programming concepts to second-level students while allowing them to have fun creating games, animations, stories, art and music.

Working with CIO Ireland, IT Tallaght and with the support of the Department of Education and Science Transition Year Support Service (TYSS), our goal is to roll this material out nationally.

Clare McInerney  
Knowledge Transfer Specialist  
Lero – The Irish Software Engineering Research Centre  
University of Limerick



CIO Ireland



science foundation ireland  
fondúireacht eolaíochta éireann

# Introduction

The goal of “Having Fun with Computer Programming and Games” is to promote and instil an interest in computing and to inspire young people such as transition year students (age 15-16) to consider careers in computing on leaving school. “Having Fun with Computer Programming and Games” is a Transition Unit.

This unit of work consists of 10 modules. Each module is distinct; however there is a progression from one module to another. Some lessons from this unit are inspired by the Computer Science Unplugged Series of activities<sup>1</sup> and do not have any requirement for a computer at all. The pack includes a Unit Marking Sheet. One sheet per student should be kept to track their progress in the assessed elements of the course in Modules 8, 9 and 10. This is included in the appendices along with a glossary of the key vocabulary that arises in the lesson plans. By using the Module title pages you can see at a glance the resources required for each lesson. See Conventions used in this Guide on the following page.

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<sup>1</sup>Materials derived from <http://csunplugged.com/> under Creative Commons Attribution-Noncommercial-Noderivative 3.0 License for more see <http://creativecommons.org/licenses/by-nc-nd/3.0/>

# Conventions used in this Guide

Symbol	Resources Required
 Computer	Any lesson that requires a <b>computer</b> . One computer per pupil is ideal.
 Scratch	<b>Scratch</b> is the software at the heart of the course. It is available free of charge. A guide to download and install Scratch comes with module 1 lesson 2.
 Internet	The <b>Internet</b> will be useful for some lessons, particularly when there is a research element involved.
 Projector	A <b>projector display</b> is the best method for teacher demonstration and for showing slideshow resources.
 Sound	<b>Sound</b> can be recorded using a microphone and output using speakers. Don't worry if you don't have any of this equipment as it is only a mandatory requirement for one of the lessons of the unit. It is recommended to use a webcam with a headset included.
 Printable Resource	Worksheets or <b>printed material</b> copied from the resource pack are required for a lesson when this symbol is present.
 CD Resource	Some of the resources such as PowerPoint presentations and Scratch solution files are software based. They come with a CD included in the unit pack and are also available for download online.
 Group Work	When <b>group work</b> is a part of a lesson this symbol will appear.

# Transition Unit Descriptor



## TRANSITION UNIT TEMPLATE

<b>UNIT DESCRIPTOR</b>	
<b>1. Title of transition unit</b>	Having fun with computer programming and games
<b>2. Area of study</b>	Top up and Tasters
<b>3. Overview</b>	<p>The goal of this Transition Unit is to introduce students to computer programming and games in a fun and exciting way. The Scratch software used in this transition unit was designed with this goal in mind. Students will be able to write their own programs, animations and stories in a matter of minutes. Students will learn how to plan and design projects. They will learn how to work together on a plan in teams and they will have the opportunity to present their work to their peers and teachers. They will learn how to respond and react to feedback. They will research a project on the Internet and learn how to evaluate information on websites.</p>
<b>4. Related learning</b>	<p>This transition unit links well with the NCCA ICT framework. It supports the development of skills needed for senior cycle Mathematics, such as problem solving and data management. In addition, the research and internet skills developed through this TU will benefit students in completing project work in many other subjects.</p>
<b>5. Summary outline of the unit</b>	<p>All the lesson plans and materials needed to teach this transition unit are available at <a href="http://www.scratch.ie">http://www.scratch.ie</a> or on CD Rom available from <a href="mailto:clare.mcinerney@lero.ie">clare.mcinerney@lero.ie</a></p> <p>These times are guidelines only. The choice of modules and the order in</p>

which they are taught is at the teacher's discretion. Core modules are marked

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### **\* Module 1: Getting Started**

**Total Estimated Time = 4 hours 20 minutes**

The goal of Module 1 is to introduce computers and the Scratch tool to students, to allow them to introduce characters and sound in Scratch.

Lesson 1 Computers Rule the World 20 minutes

Lesson 2 Say "Hello" to Scratch 40 minutes

Lesson 3 Playing with Pictures 40 minutes

Lesson 4 Tell me what to do 40 minutes

Lesson 5 Playing with Music 120 minutes

### **\* Module 2: Drawing Shapes and Repeating**

**Total Estimated Time = 2 hours 40 minutes**

The goal of Module 2 is to allow students draw different shapes in Scratch and to learn about repetition.

Lesson 1 Think Like a Computer 80 minutes

Lesson 2 Could You Repeat That Please? 40 minutes

Lesson 3 Over and Over Again 40 minutes

### **Module 3: Searching and Sorting**

**Total Estimated Time = 4 hours**

The goal of Module 3 is to teach students how to search and sort data using a Battleships game. Students are guided on how to search for information on the Internet.

Lesson 1 Where are you now? 80 minutes

Lesson 2 Me First! Sorting 80 minutes

Lesson 3 CSI – Finding Information on the Internet 80 minutes

### **\* Module 4: Build a Game**

**Total Estimated Time = 2 hours 40 minutes**

The goal of Module 4 is to allow students to build a game in Scratch and to teach students how sounds and images are stored and how they can record and import sounds into Scratch.

Lesson 1 Game On 40 minutes

Lesson 2 Game Over 40 minutes

Lesson 3 Look at Me 40 minutes

Lesson 4 I Can't Hear You 40 minutes

### **Module 5: Revision with Scratch Cards**

**Total Estimated Time = 4 hours**

Students revise some basic Scratch ideas using 3 different levels of cards: easy, difficult and extreme. This will require printing and cutting out the Scratch cards but it can be a lot of fun.

Lesson 1 Scratch Cards Easy 40 minutes

Lesson 2 Scratch Cards Difficult 80 minutes

Lesson 3 Scratch Cards Extreme 120 minutes

### **Module 6: Changing Things**

**Total Estimated Time = 2 hours 40 minutes**

This module gives students the opportunity to modify existing programs. This

is a very popular module with students.  
Lesson 1 I Like Mine Better 1 80 minutes  
Lesson 2 I Like Mine Better 2 80 minutes

### **Module 7: Solving Complex Problems**

#### **Total Estimated Time = 2hours**

Module 7 introduces two complex computer science problems, The Towers of Hanoi and The Travelling Salesman Problem to students.

Lesson 1 The Towers of Hanoi 40 minutes

Lesson 2 The Travelling Salesman Problem 80 minutes

### **Module 8: Research Project**

#### **Total Estimated Time = 8+ hours**

Students are divided into groups and research a topic on the Internet. They present their research topic to the class.

Lesson 1 Getting Started 40 minutes

Lesson 2 Research Time 240 minutes

Lesson 3 What is a good Presentation? 120 minutes

Lesson 4 Presentation Time 80+ minutes

### **Module 9: Advanced Game**

#### **Total Estimated Time = 2 hours 40 minutes**

In this module students implement an Advanced Game in Scratch.

Lesson 1 Advanced Game Design 40 minutes

Lesson 2 Advanced Game Improvements 40 minutes

Lesson 3 Advanced Game Finishing Touches 40 minutes

Lesson 4 Advanced Game Testing 40 minutes

### **\* Module 10: Scratch Project**

#### **Total Estimated Time = 12+ hours**

Students are divided into groups and work on their final project.

Lesson 1 Getting Started 40 minutes

Lesson 2 Sharing – Setting Up a Scratch Account 40 minutes

Lesson 3 Create 480+ minutes

Lesson 4 Publish and Present 80 minutes

Lesson 5 Presentations 80 minutes

These times are guidelines only. The choice of modules and the order in which they are taught is at the teacher's discretion.

## **6. Breakdown of the unit**

### **Total Estimated Time for 10 Modules = 45 hours**

This TU is presented in modules. A teacher may select what modules to teach.

We would recommend that you teach the following core modules.

#### **Core Modules**

Module 1 Getting Started 4 hours 20 minutes

Module 2 Drawing Shapes and Repeating 2 hours 40 minutes

Module 4 Build a Game 2 hours 40 minutes Module 10 Scratch Project 12+ hours	
<b>7. Aims</b>	
<i>This transition unit aims to:</i>	
<ul style="list-style-type: none"> <li>▪ Introduce students to basic programming concepts in a fun and exciting way using a tool called Scratch.</li> <li>▪ Encourage students to work in teams to create exciting animations, games and stories.</li> <li>▪ Present students with the opportunity to explore their creative and artistic side by creating interactive projects.</li> </ul>	
<b>8. Learning outcomes</b>	
<i>On completion of this unit students should be able to:</i>	
<ul style="list-style-type: none"> <li>▪ Solve problems by analysing a problem and breaking it down into its constituent parts</li> <li>▪ Design a high level solution to a problem</li> <li>▪ Implement the solution to a particular problem in Scratch using programming concepts</li> <li>▪ Implement the solution to a particular problem in Scratch using mathematical and computational ideas</li> <li>▪ Update, modify and maintain existing software projects in Scratch.</li> <li>▪ Use 21<sup>st</sup> century learning skills</li> <li>▪ Explain computer science challenges that face computer science researchers today.</li> <li>▪ Conduct Internet research and evaluate Internet websites.</li> <li>▪ Demonstrate good teamwork skills.</li> <li>▪ Make a presentation to their classmates</li> <li>▪ Give and receive constructive feedback on their project work</li> </ul>	
<b>9. Key skills</b>	<b>How evidenced</b>
information processing	Through the activities and worksheets students are guided in how to research and record information on the Internet for research projects. They are also helped in developing the skills to evaluate and extract appropriate information.
critical and creative thinking	The students will get the opportunity to incorporate creative thinking into their Scratch projects and research projects. Critical and creative thinking will also be encouraged when providing feedback to class mates on student research projects.
communicating	Presenting a research project and a Scratch project

	to the class. Working in teams to build a Scratch project. Providing feedback and suggestions to classmates.
working with others	Planning and designing a Scratch project will give students an excellent insight into working with others. They will learn how to organise and delegate work within a group, and how to take responsibility for tasks and complete them to agreed deadlines.
being personally effective	Writing computer programs, animations, games and stories will give students a great sense of accomplishment and achievement as they will be able to incorporate their ideas and designs and see them coming to life in a finished product.
<b>10. Teaching approaches</b>	
A wide variety of methodologies will be used including cooperative learning, self-directed and independent learning, group work, pair work, discussion, debate, project work and research, use of ICT for research and presentations, use of digital cameras. Cross curricular linkages across learning will be fostered and cross application of skills learned.	
<b>11. Assessment approaches</b>	
Students will be assessed on the following units: <ol style="list-style-type: none"> <li>1. Research Project, Research Project Presentation, Research Project General</li> <li>2. Advanced Game Testing</li> <li>3. Scratch Group Report, Scratch Project Presentation, Scratch Project General</li> </ol> <p>These are available in Appendix 1 under Appendices of the materials on <a href="http://www.scratch.ie">www.scratch.ie</a> or on your CD</p>	
<b>12. Evaluation</b>	
<p><b>Student Evaluation:</b> See Student Questionnaire in Appendix 3</p> <p><b>Teacher Evaluation:</b> See Teacher Questionnaire in Appendix 3</p> <p>See Appendices of the materials on <a href="http://www.scratch.ie">www.scratch.ie</a> or on your CD</p>	
<b>13. Resources</b>	

To download the Scratch teaching materials developed by Lero please go to <http://www.scratch.ie>

To download the Scratch software go to the Scratch MIT Website

<http://scratch.mit.edu>

(Both resources are freely available)

If you would like us to send you a CD, please contact [clare.mcinerney@lero.ie](mailto:clare.mcinerney@lero.ie) or Clare McInerney at 061 202434.

For more information regarding the materials, professional development or any other queries please contact

**Clare McInerney,**

**Education and Outreach Officer,**

**Lero – The Irish Software Engineering Research Centre,**

**University of Limerick, Ireland,**

**Tel: +353 61 202434**

**[clare.mcinerney@lero.ie](mailto:clare.mcinerney@lero.ie)**

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