



# A survey of resources for introducing coding into schools

---

**Dr. D. Francisco José García Peñalvo**

research GRoup in InterAction & eLearning (GRIAL)  
Research Institute on Educational Sciences  
Computer Science Department  
University of Salamanca

[fgarcia@usal.es](mailto:fgarcia@usal.es)  
<http://grial.usal.es>  
<http://twitter.com/frangp>



# TEEM'16

TECHNOLOGICAL ECOSYSTEMS  
FOR ENHANCING MULTICULTURALITY

**4<sup>th</sup> International Conference on Technological Ecosystems for Enhancing Multiculturality, TEEM 2016**  
Salamanca, Spain  
November 2-4, 2016



**VNiVERSiDAD  
D SALAMANCA**

CAMPUS DE EXCELENCIA INTERNACIONAL



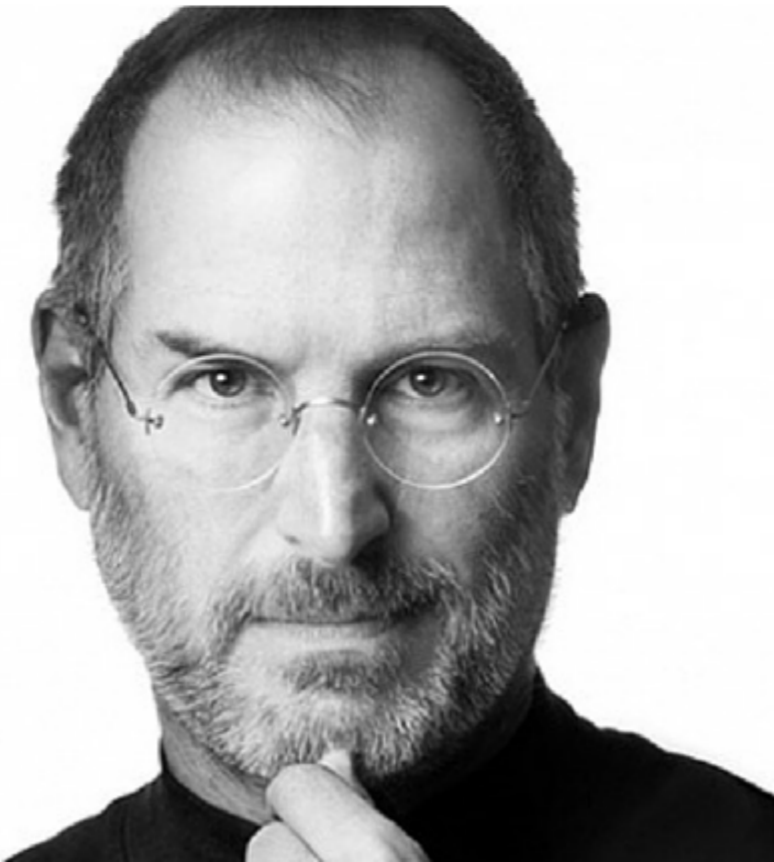
# Outline

---

1. Introduction
2. TACCLE 3 - Coding
3. Project website
4. Resources Catalogue
5. How to participate

Everybody in this  
country should  
learn to program a  
computer, because  
it teaches you how  
to think

- Steve Jobs -



1. Introduction



# The Software Society

---



# Introduction of software programming in pre-university education

---



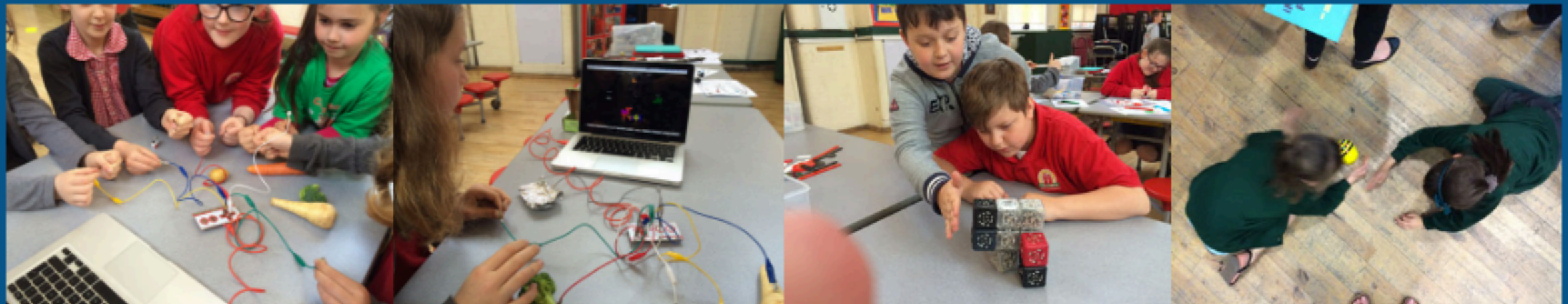
- Different initiatives in different countries
- Promote employability and STEM approach
- Teaching programming/computer science must be contextualized to not get the opposite result from that sought
- Computational thinking as one of the core competencies of the 21<sup>st</sup> century

# Computational Thinking

---

“Computational thinking involves solving problems, designing systems, and understanding human behaviour, by drawing on the concepts fundamental to computer science” (Wing, 2006)

“Computational thinking as the application of high level of abstraction and an algorithmic approach to solve any kind of problems” (García-Peñalvo, 2016)



## 2. TACCLE 3 - Coding





# Taccle 3 – Coding project information

---

- European project that aims to support Primary School and other teachers who want to teach Computing to 4 – 14 year olds. It equips classroom teachers with the knowledge and the materials they need by developing a website of ideas and resources together with in-service training courses and other staff development events
- Funded by the European Union Erasmus + KA2 Programme (Ref. 2015-1-BE02-KA201-012307)
- Duration: September 2015 – August 2017
- Global budget: 279.940€
- <http://www.taccle3.eu/>



# Consortium

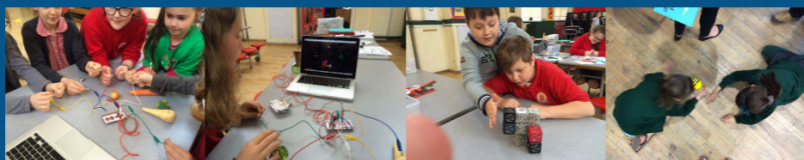
---

- GO! Het Gemeenschapsonderwijs (Belgium) – Coordinator
- Pontydysgu Limited (United Kingdom)
- Scholengroep 1 Antwerpen (Belgium)
- Karlsruher Institut Fuer Technologie (Germany)
- Hariduse Infotehnoloogia Sihtasutus (Estonia)
- Tallinn University (Estonia)
- University of Salamanca (Spain)
- Aalto-Korkeakoulusaatio (Finland)
- Itä-Suomen yliopisto (Finland)

# Project aims

---

1. To equip fellow classroom teachers, whatever their level of confidence, with the knowledge and the materials they need to teach coding effectively
2. To develop a website of easy-to-follow and innovative ideas and resources to aid teachers in teaching coding. It will also include a review of the current academic research and an overview of the resources currently available for teaching coding
3. To provide national and international in-service training courses and other staff development events to help support and develop confidence and competences in teaching coding



Taccle 3 Coding is a project funded under Erasmus+ that supports Primary School and other teachers who want to teach Computing to 4 - 14 year olds. Taccle 3 will equip classroom teachers with the knowledge and the materials they need by developing a website of ideas and resources together with inservice training courses and other staff development events

Many European countries are introducing Computing as a core curriculum subject. Some have already done so; others are intending to. Inevitably the detail of the curricula will be different in each country but there is a substantial overlap - most all of the curricula available so far include coding/programming, control technology and computational thinking so we have started with these.

Click on [Ideas and Resources](#) or choose from the dropdown above to find curriculum linked resources for teachers in your language.

### THE TACCLE BRAND

- Taccle1
- Taccle2
- eLearning for Primary Teachers
- eLearning for STEM Teachers
- eLearning for Creative and Performing Arts
- eLearning for Teachers of Key Competences
- eLearning for Humanities Teachers
- Training Courses

### NEWS

- Learning Futures  
3 months ago with no comments
- High Quality Resources  
3 months ago with no comments
- Salamanca Meeting  
3 months ago with no comments
- First steps in Taccle3  
10 months ago with no comments

### CODING IN ACTION

- Ynysowen Community Primary School use Sketch up to design their own e-portfolios  
5 months ago with 1 comment
- Ysgol Bryn Eilian pupils coding music with Sonic Pi  
9 months ago with 1 comment
- Bryn Deri Primary School use Scratch to learn maths.  
9 months ago with no comments
- MaKeyMaKey Workshops at Tonypandy Primary  
10 months ago with 1 comment

### #TACCLE3

- 4 days ago  
RT @angelarees: Such a good #edublog [/t.co/SB8zEWMQ0w](https://t.co/SB8zEWMQ0w) lots of great #coding #computing ideas and resources #taccle3
- 4 days ago  
RT @babi\_tech: So much useful research here on children interacting with computers from @ChiCiGroup [/t.co/KkeSBN0gqc](https://t.co/KkeSBN0gqc) :) #Taccle3 #Ba...
- 18 days ago  
Join the @Taccle3 mailing list and share the ways you teach #coding in your classroom [/t.co/Qa1Vwjou0m](https://t.co/Qa1Vwjou0m)

### META

- [Log in](#)
- [Entries RSS](#)
- [Comments RSS](#)
- [WordPress.org](#)

SCROLL DOWN FOR THE MOST RECENT RESOURCES FROM AROUND EUROPE

## 3. Project website



# Content organisation

---

- We start with European reality in which many governments are introducing programming as an essential material official curricula
- This is already a reality in some countries, while others are studying how to do
- The level of detail of each curriculum will be different in each country, but there are common elements in all of them
- The following items may be highlighted: **programming, control technologies** and **computational thinking**

# Content organisation

english

## Taccle 3 Coding

USING THIS SITE
USING LOGIC
ALGORITHMS
CREATING + DEBUGGING PROGRAMS
CONTROLLING THINGS



**Intro to Makey Makey – Musical Fruit →**

3 month ago with no comments in Beginners, Controlling things

There are hundreds of things you can do with MaKeyMaKey but the best place to start has to be with something simple and fun.



**MaKey MaKey tried and tested →**

3 month ago with no comments in Controlling things

A list of games and apps which work well with MaKey MaKey.



**Makey Makey – Cardboard guitar →**

3 month ago with no comments in Advanced, Controlling things

In this lesson the class will make musical instruments out of cardboard and tinfoil.

**TACCLE 3 PORTAL**



Taccle 3 is a European project funded by the Erasmus+ programme. You can find more information about the project on the [Taccle 3 Portal](#).

---

**TAGS**

ABSTRACTION ALGORITHM BEEBOT BUGS CODE
CODING COMPUTATIONAL THINKING
CONTROL TECHNOLOGY CURRICULUM
DECOMPOSITION DIGITAL LITERACIES FUN
FUTURE TECHNOLOGY IDLE IF...AND IF..THEN
INPUT / OUTPUT INSTALLATION INSTRUCTIONS
INTERNET LIGHTBOT LOGIC MAKEY-MAKEY
MINDMAPPING MUSIC NEGATIVES NEW PEDAGOGY
NOT PATTERN RECOGNITION PATTERNS PROGRAM
PROGRAMMING PROGRAMMING CARDS PYTHON
REASONING ROBOTS SCRATCH JUNIOR SEQUENCE
SETS SONIC PI SORTING SYNTAX TARGETS
THE FUTURE TILDA

# Resources

---

- The different project outcomes are oriented to teacher will have access to the knowledge and the resources they need for teaching coding
- Taccle3 is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License

# Activities

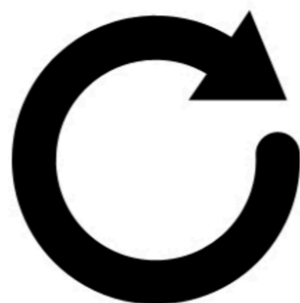


## KS2: LOOPS AND HOW THEY WORK

4 MONTHS AGO BY [JEN HUGHES](#) WITH [NO COMMENTS](#) AND 82 VIEWS

Beginners

A loop is a sequence of instruction that is repeated for a specified number of times or until a particular outcome is reached. This lesson introduces the idea and how they can use loops in coding



LOOPS REPEAT  
ACTIONS...  
SO YOU DON'T HAVE TO

### Aims

- Explain what loops are in coding
- Write a simple program incorporating a loop

### What are loops?

Explain to pupils that one thing that computers are really good at is repeating commands. Much better than people are. Ask them what would happen if they had to do the same task over and over and over again. Maybe a thousand times over or for hours and hours. You will probably get answers such as

- "You'd get bored"
- "It would take for ever"
- "You'd get tired"
- "You might start making mistakes"

Explain that computers can do the same thing over and over – maybe for a million or a billion times and not get bored or tired. What's more, they can do it very fast and every time they do it is exactly the same.

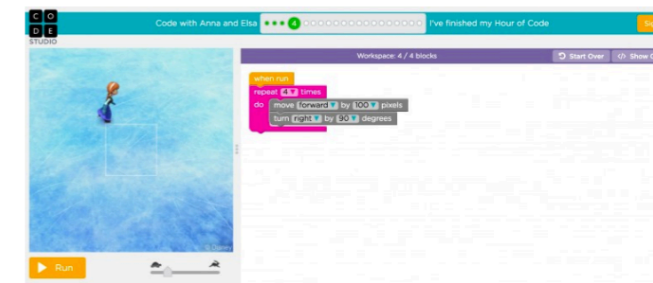
If you write code to tell a computer to do something lots of times, it's called a loop.

### Coding with Elsa and Anna

Go to

<https://studio.code.org/s/frozen/stage/1/puzzle/1>

Kids love this programme as it is based on Elsa from Frozen skating over ice and leaving tracks in the ice. It is based on a drag and drop block programme similar to Scratch. You should complete the first few exercises to start with (drawing lines and a square) even though they are not actually about loops – but it is a pre-requisite bit of understanding. Then there is a useful video about Loops, which is easy to understand, and some more exercises on programming loops.



### Using Scratch or Scratch Junior

You can, of course, use any other coding programme you use to demonstrate this. For example, if you use **Scratch**, select the 'move forward block'. Run the program and see what happens to the 'sprite' (the little cat). Then drag another 'move forward' block underneath it and run it again. Do this 4 or 5 times until you have a stack of identical 'move forward' blocks. Then clear the screen, drag one 'move forward' block in, drag a repeat bracket around it and type the figure 5. Run the programme again.

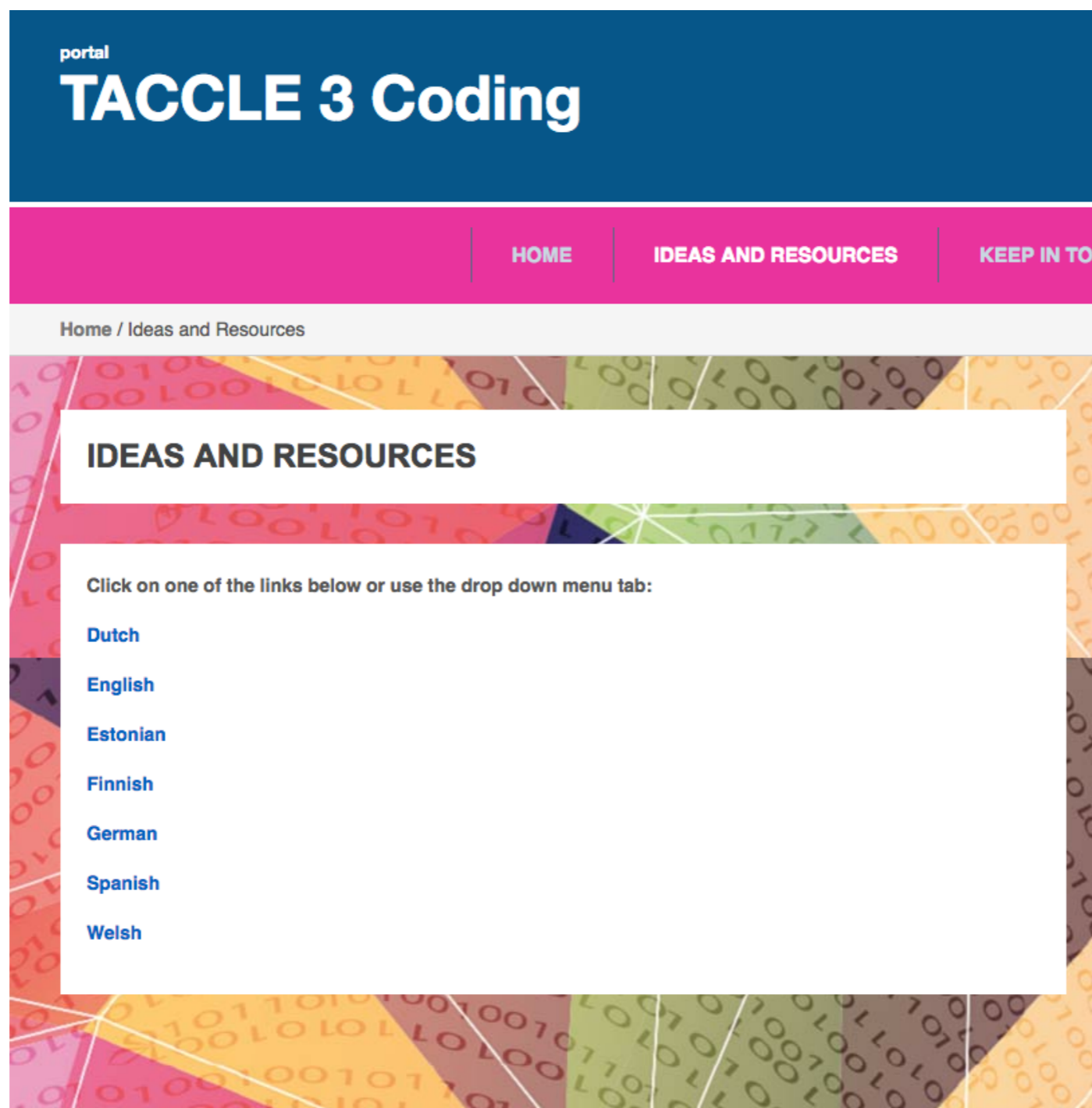
Ask what are the advantages in creating a loop as opposed to dragging in 5 'go forward' blocks.

Add an extra command inside the bracket, such as 'turn right 90 degrees', put x 4 as the number of repeats. Ask the class if they can visualise in their heads what shape the sprite might walk in. If they find that too hard, they could draw it on paper. Making predictions about what a programme will do is an important skill.

In **Scratch Junior**, you can do the same thing and we have written a whole lesson on this as part of the Learning to use Scratch Junior set of lessons.



<http://www.tacple3.eu/english/2016/05/19/ks2-loops-and-how-they-work/>

A screenshot of the TACCLE 3 Coding portal website. The page has a dark blue header with the text "portal" and "TACCLE 3 Coding". Below the header is a pink navigation bar with three tabs: "HOME", "IDEAS AND RESOURCES", and "KEEP IN TOUCH". Underneath the navigation bar is a grey breadcrumb trail that reads "Home / Ideas and Resources". The main content area has a background of colorful geometric shapes with binary code (0s and 1s) overlaid. A white box in the center contains the heading "IDEAS AND RESOURCES" and a list of language links: Dutch, English, Estonian, Finnish, German, Spanish, and Welsh. Above the list is the instruction "Click on one of the links below or use the drop down menu tab:".

portal  
**TACCLE 3 Coding**

HOME | IDEAS AND RESOURCES | KEEP IN TOUCH

Home / Ideas and Resources

## IDEAS AND RESOURCES

Click on one of the links below or use the drop down menu tab:

- [Dutch](#)
- [English](#)
- [Estonian](#)
- [Finnish](#)
- [German](#)
- [Spanish](#)
- [Welsh](#)





## 4. Resource Catalogue

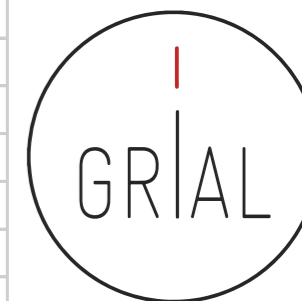


# Review methodology

---

- TACCLE 3 will equip classroom teachers with the knowledge and the materials they need by developing a website of ideas and resources together with in-service training courses and other staff development events
- In the TACCLE 3 coding project, a lack of didactic material for teachers to get started teaching coding to young pupils from primary school level on, was identified
- In order to compensate such deficit, a survey of resources and starter kits to support the teachers' approach to teach coding at primary school level was undertaken
- During the April-September 2016 period, a collection of ideas, and pupil oriented tools and environments such as iconic programming software, literature, and examples of good practice in video towards coding, computational thinking and STEM was reviewed, analysed, evaluated and documented following the TACCLE 3 template
- In this template the resources were classified following the TACCLE 3 criteria in these categories: Algorithms, Using logic, Controlling things, and Creating and Debugging
- After that, in order to create a resource catalogue for introducing to programming, a resource map has been generated using other complementary classification: App for teaching coding, Robotic, Maker stuff, Programming language, Book, Info site, and Training course

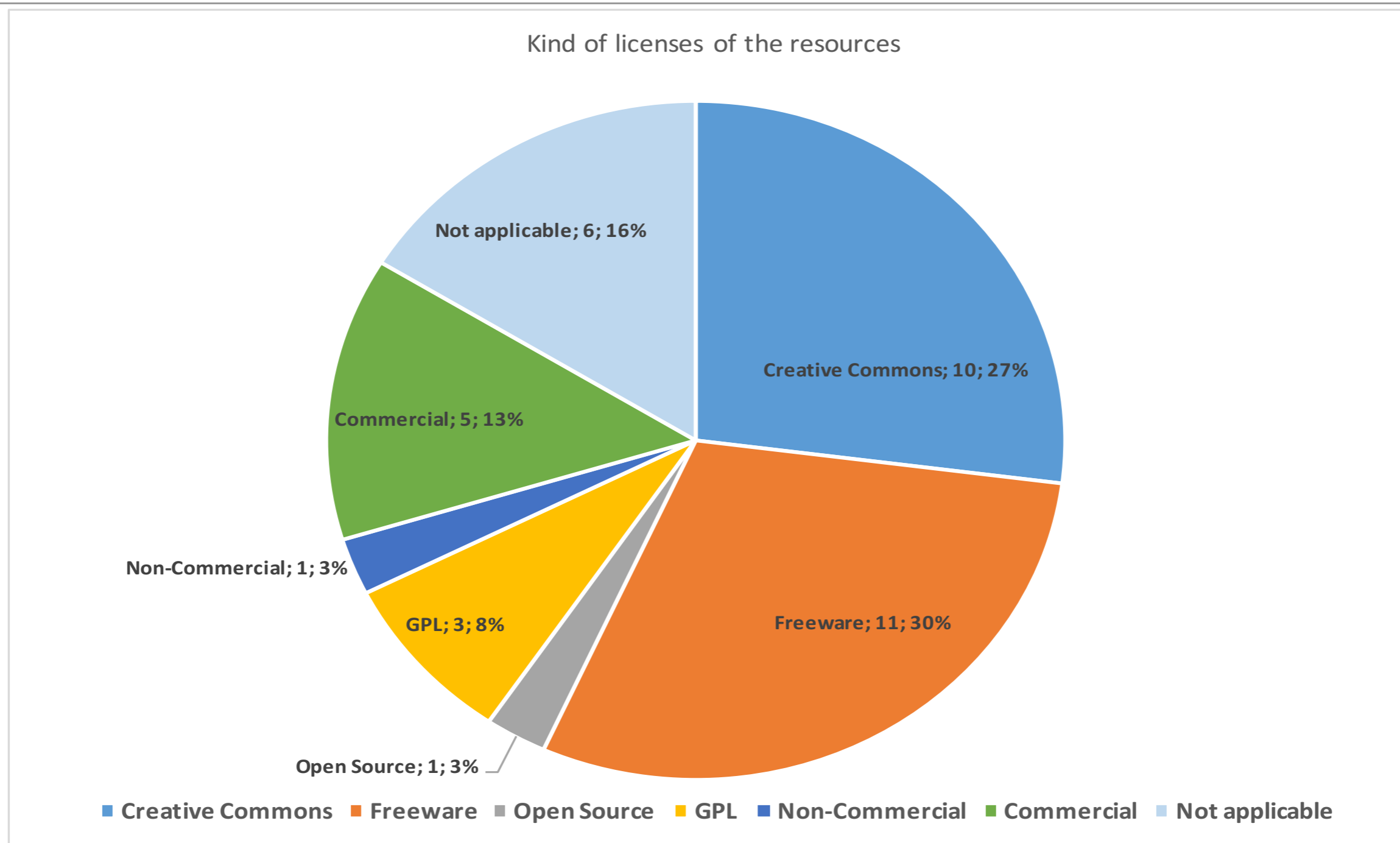
# Review results



Title	License
BAXTER ROBOT	Commercial
Geomagic Touch Haptic	Commercial
Minecraft	Commercial
SCRATCH	Creative Commons
Pedagogical Conversational Agent: Dr. Roland	Creative Commons
5phero Kids	Freeware
AMICI Programming environment with an iconic interface for Arduino LilyPad and Smart Textile	GPL
Edu Wear Starter kit: Wearable intelligence – for clothes, sports and games	GPL
Zauberschule Informatik - Ein erster Einblick in die Welt der Informatik	Creative Commons
Kodu Game Lab	Personal and Non-Commercial
3pi robotics platform e-course	Creative Commons
MSW Logo	Freeware
Studio.code.org - Course 2	Creative Commons
Ozobot	Commercial
Minetest	LGPL
Soy Minero	-
TACCLE 3: Coding web site	Creative Commons
123D Design	Freeware
Tynker Coding for code	-
Tynker Hour of code	-
Blockly for Dash & Dot Robots	Freeware
Path for Dash Robot	Freeware
Code.org	-
Code Studio	-
Code.org Hour of Code	-
MIT App Inventor	Creative Commons
MaKey MaKey	Commercial
Arduino	Open source
CS Unplugged. Computer Science without a computer	Creative Commons
Making-Aktivitäten mit Kindern und Jugendlichen. Handbuch zum kreativen digitalen Gestalten	Creative Commons
Magical Clothing	Freeware
Koodiaapinen	Creative Commons
Koodikirja	Freeware
Hello Ruby	Freeware
Koodikoulu	Freeware
The Foos	Freeware
Proge Tiger	Freeware

## Reviewed resources list

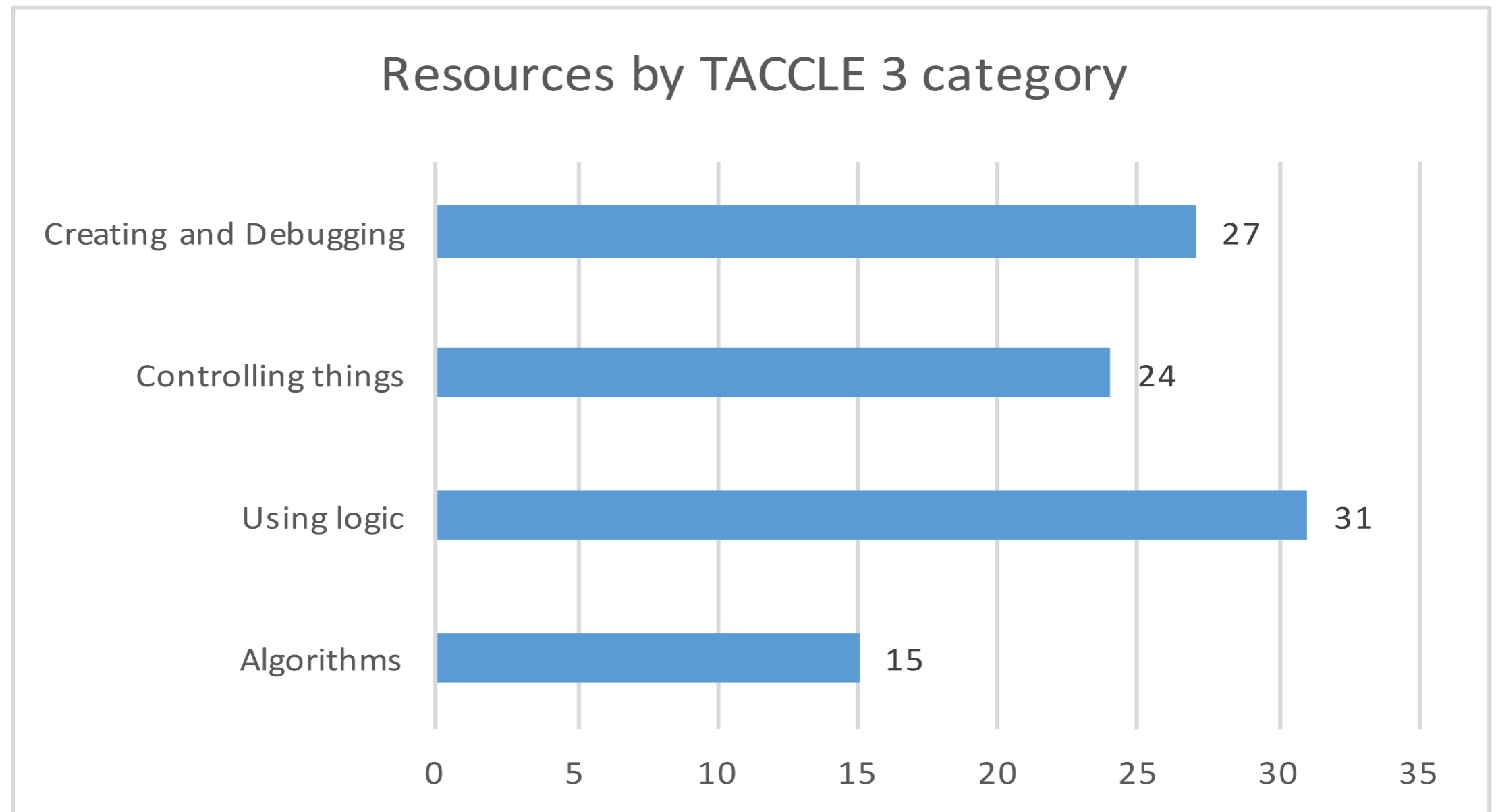
# Review results



## Licenses of the reviewed resources

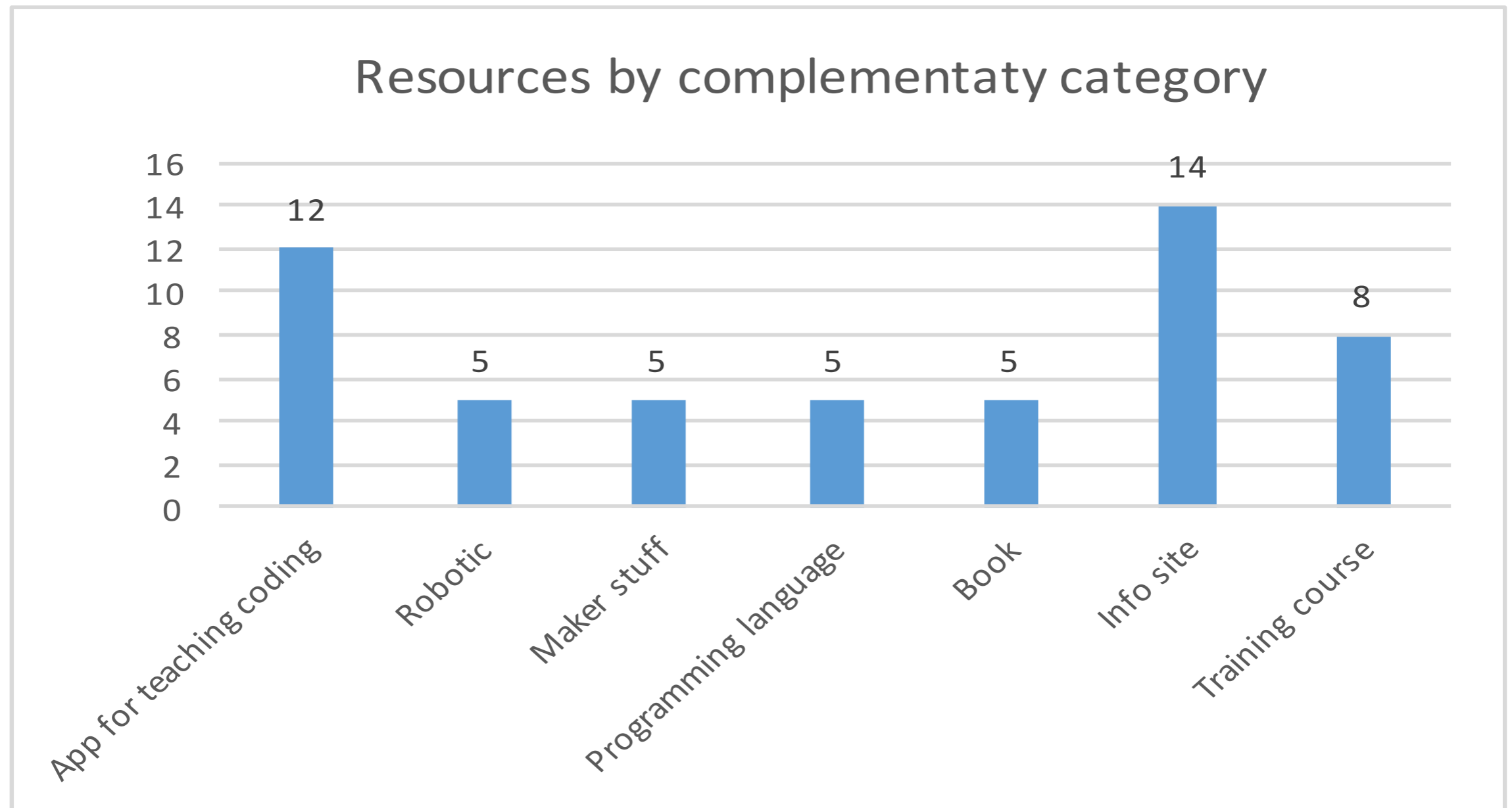
A survey of resources for introducing coding into schools

# Review results



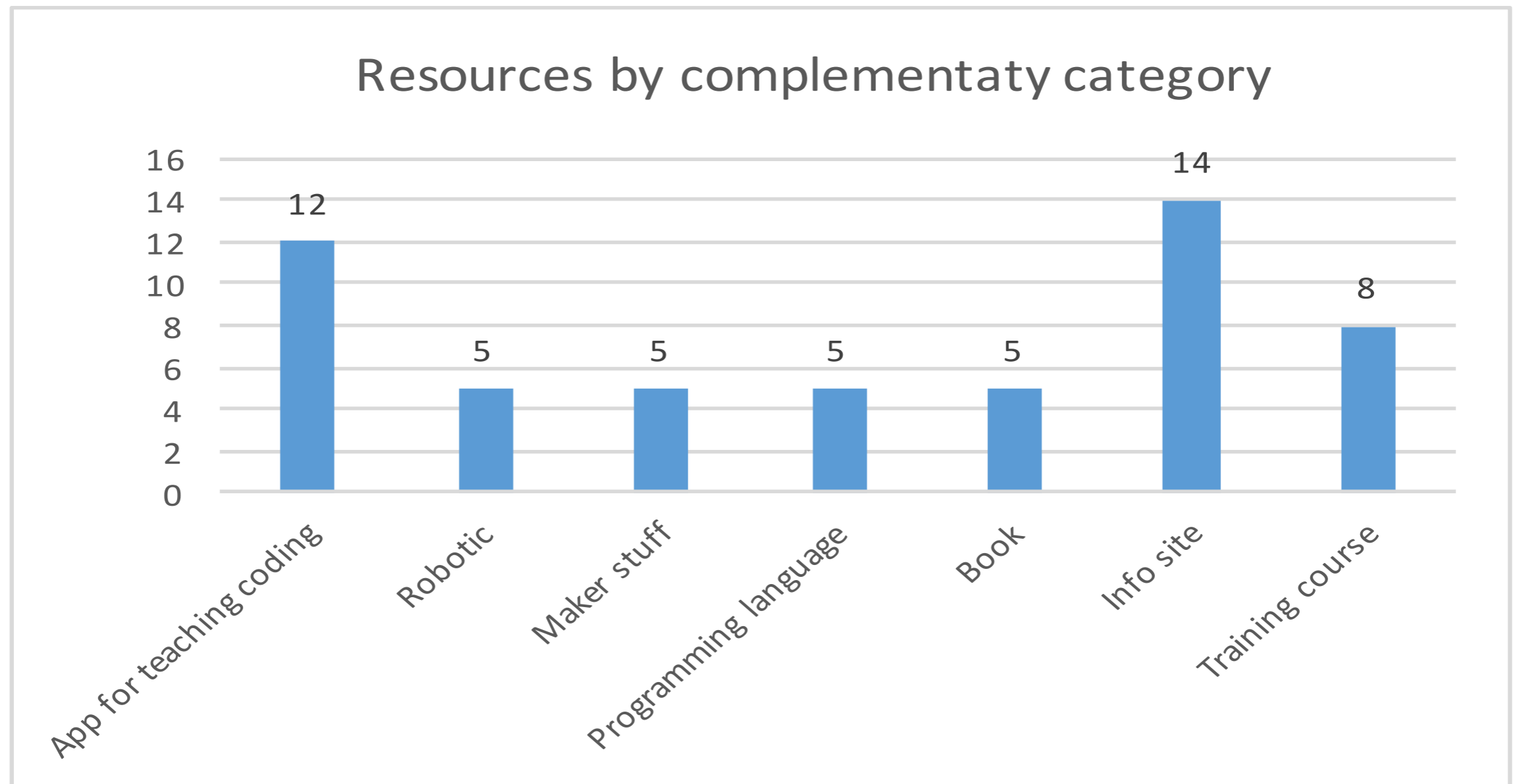
Reviewed resources classified by category

# Review results



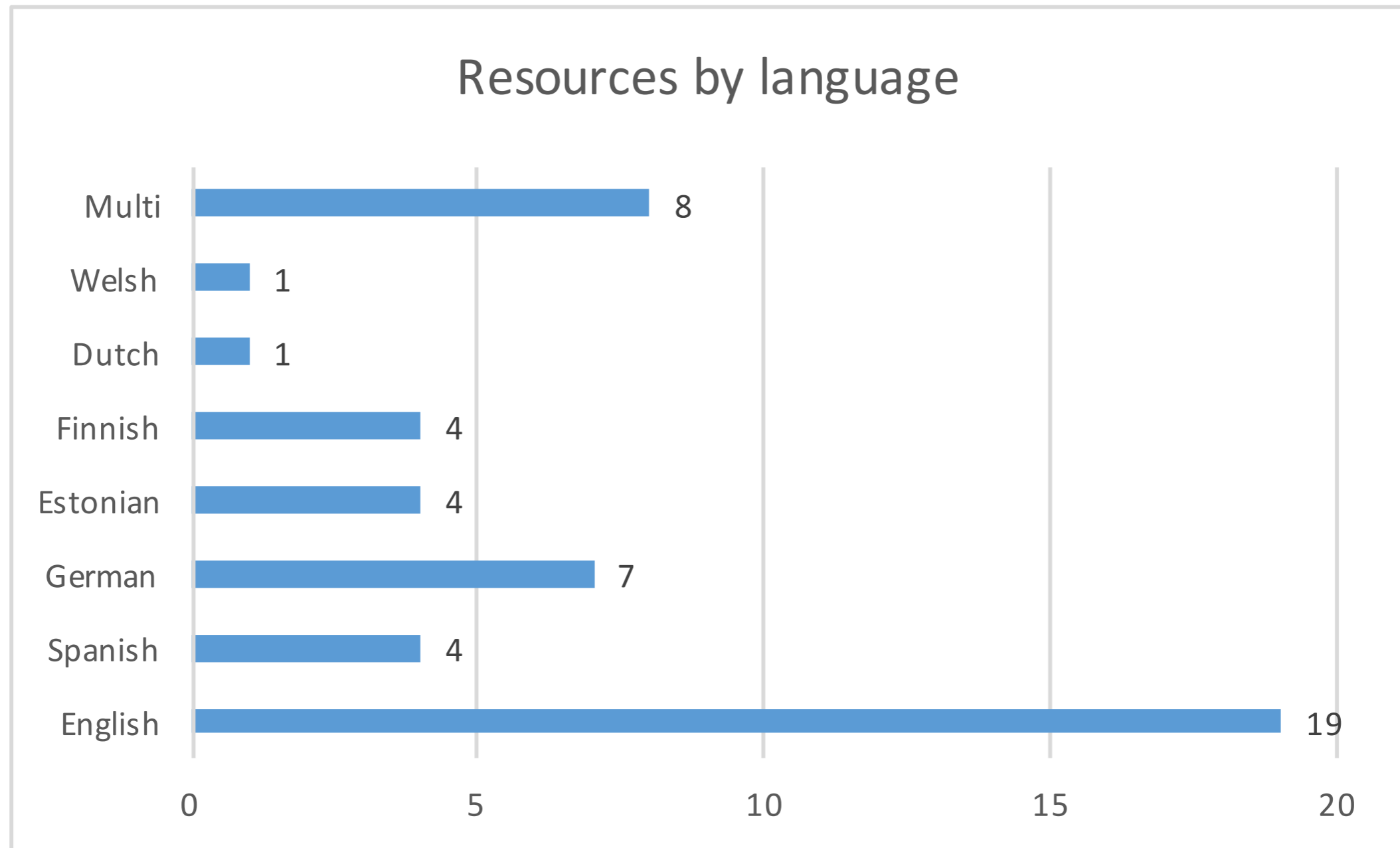
Reviewed resources classified by the complementary classification

# Review results



Reviewed resources classified by the complementary classification

# Review results



Languages of the reviewed resources





5. How to participate



# Different ways for participating in TACCLE3

---

- Visiting the website to access to the resources
- Writing news related to coding in the schools
- Making learning activities following the next scheme

Title

1. Overview

Brief description

Age

Level

21st Century skills

Tips to adapt the lesson (for example to older/younger students, students with special needs, etc.)

Material

2. Aim of the activity

3. Needed tools and resources

4. Practical activity description

- Making resource reviews (products, tools, books, courses, etc.) oriented to other teachers. There exists a recommended template <https://dx.doi.org/10.6084/m9.figshare.3545033.v1>
- Making courses



## 6. Conclusions



# Conclusions

---

- Introducing coding or programming in the pre-university studies is a big challenge for all
- Timing and decision making to act formally at the curricula level is not an easy way
- Too many teachers are introducing computing far away the digital literacy competences but usually they make it isolated in their subjects
- TACCLE 3 project is trying to create a significant teacher community, which shares the objective of introducing programming and/or computational thinking in their classes, and also looking for breaking this isolation effect and making an attraction effort for new teachers that want to but do not dare to give a step beyond
- The first step to create the community is having a website with attractive resources
- We have presented the first approach to build up a resource catalogue to help them to find suitable teaching paths and make decision to introduce activities that help students to discover or go further into the programming and computational thinking



# Acknowledgement

---

Funded by European Union Erasmus+ KA2 Programme  
“TACCLE 3 – Coding” (2015-1-BE02-KA201-012307)

*This project has been funded with support from the European Commission. This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein*



# This presentation is available

---

<http://www.slideshare.net/grialusal/a-survey-of-resources-for-introducing-coding-into-schools>

<http://repositorio.grial.eu/handle/grial/683>



# A survey of resources for introducing coding into schools

---

**Dr. D. Francisco José García Peñalvo**

research GRoup in InterAction & eLearning (GRIAL)  
Research Institute on Educational Sciences  
Computer Science Department  
University of Salamanca

[fgarcia@usal.es](mailto:fgarcia@usal.es)  
<http://grial.usal.es>  
<http://twitter.com/frangp>



# TEEM'16

TECHNOLOGICAL ECOSYSTEMS  
FOR ENHANCING MULTICULTURALITY

**4<sup>th</sup> Technological Ecosystems for Enhancing Multiculturality, TEEM 2016**  
**Salamanca, Spain**  
**November 2-4, 2016**



**VNiVERSiDAD**  
**DiSALAMANCA**

CAMPUS DE EXCELENCIA INTERNACIONAL