

# COLOURS IN FASHION



## STEMJAM Teaching Guide

Developing make spaces to promote creativity  
around STEM in schools

Acronym: STEMJAM

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# COLOURS IN FASHION

## ABSTRACT

The activity aims to help in learning the theory of colours composition and vision (spectrum, primary and secondary colours, RGB colours composition) and consists of three separate phases

1. An exploratory physics laboratory on colours
2. A competition-based assessment of what the students learnt
3. The development a final software that will use the computer webcam to identify student's sweater and suggest a matching colour through its onboard LEDs.

It was originally designed to grasp the attention of students with a curriculum focused on the fashion industry and therefore include applications to this specific context, which may help to rise the student interest, especially among girls.

Any of these three passages helps the students to learn different features of mBot programming and takes approximately 2-3 hours for code development and 1 hour to be "played".

## DIDACTIC OBJECTIVES

- ❖ Science: Biology of the human eye
- ❖ Physics: Colours spectrum, Colours Composition, Colours of paint and light
- ❖ Physics: RGB technology for creating colours
- ❖ Matching colours in fashion
- ❖ Computer Science: webcam feature in mBlock program
- ❖ Computer Science: the random selection of a variable
- ❖ Computer Science: controlling the mBot with wifi connection
- ❖ Computer Science: use Appinventor for smartphone application development
- ❖ Soft Skills: team-working and duty-sharing awareness

STEM Subject:    Science             Technology             Engineering             Mathematics

Education Level:            12-14 years             14-16 years

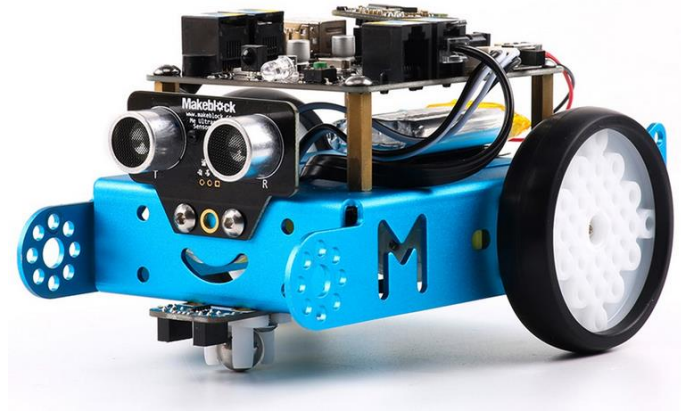


## PROBLEM STATEMENT

Discover colours spectrum, primary and secondary colours, the theory of vision, RGB colours composition.  
Apply these knowledge to identify possible colour matching mechanisms for dressing purpose.

### BOM (Bill of Materials Needed)

- mBot => Ref. 90054



- ❖ Me LED Matrix 8 × 16:



- ❖ Colour filters.
- ❖ PC equipped with a webcam (usually laptops have an integrated camera).
- ❖ App Inventor Software.

## ACTIVITY DESCRIPTION

The activity consists of three separate phases (all using mBot of course!):

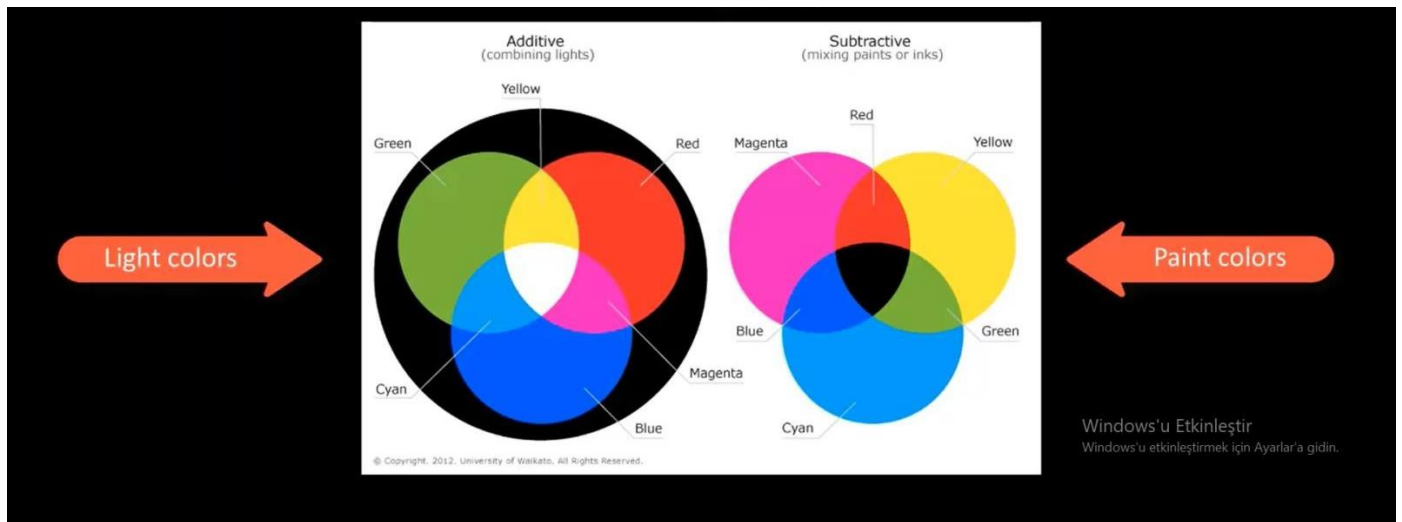
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In the following we give directions for the three phases and comment the relates Scratch codes.

### Phase 1. Colours Lab

Here we use the Light Emitting Diodes from the Me Led module as a colour light source to study the additive and subtractive colour synthesis. The Led module is mounted on the bottom, pointing towards the desk (or table or floor) where a white sheet of paper is properly placed as a background.



In the first part the led are turns on with two primary colours at a time and the color observed on the paper, resulting from their addition, is observed. To perform this part the student may complete the table proposed below

PRIMARY COLORS AND ADDITIVE SYNTHESIS				
<i>Basic Combinations</i>				
<i>(all colours with the same intensity)</i>				
Rosso	+	Verde	=	
Rosso	+	Blu	=	
Verde	+	Blu	=	
Rosso	+	Verde + Blu	=	
<i>Other Colors – Custom Combinations</i>				
Rosso 255	+	Verde 60	=	Arancione
	+		=	
	+		=	
	+		=	

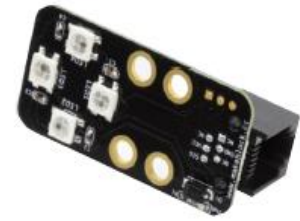


Figure 1. The 4 leds on the RGB led module. Two opposite leds are turned on in one color, the other two with the second one.

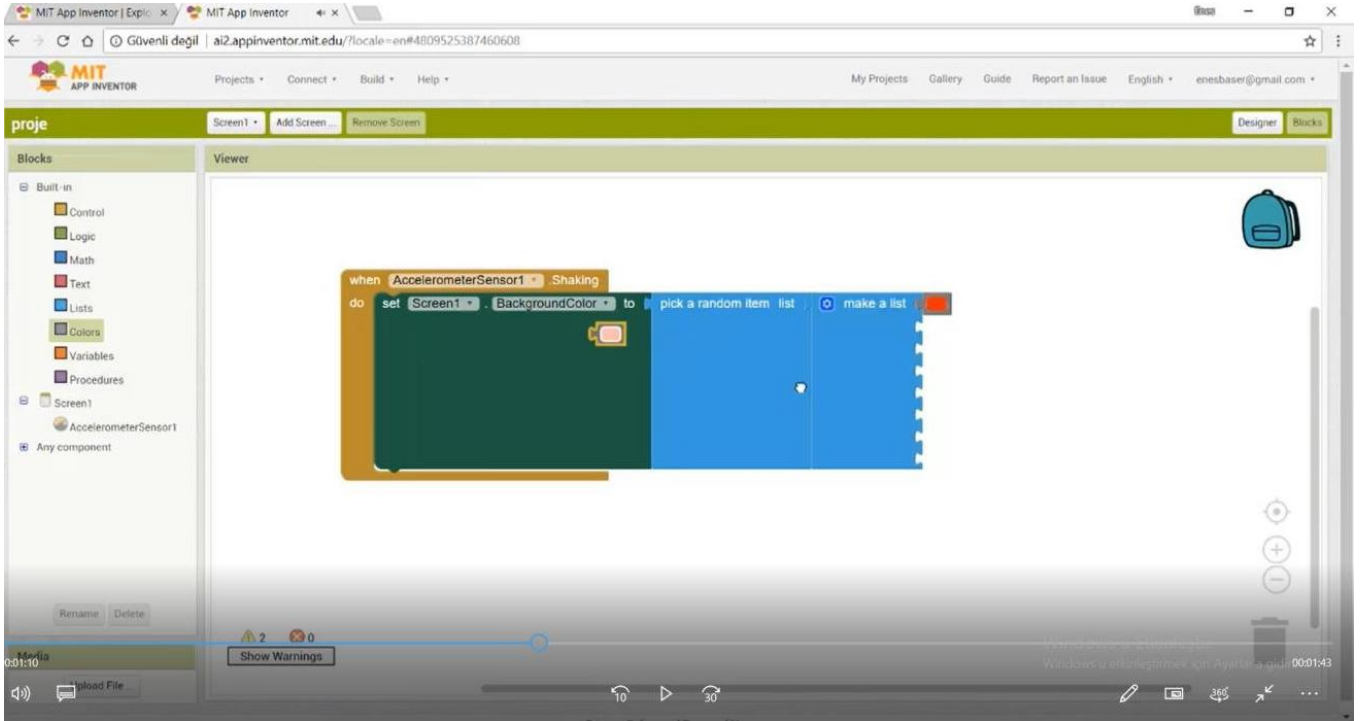
In a second moment the leds are turned on with white light and two different plastic coloured sheets are used to filter light. The first sheet in front of light must be one of the secondary colours (cyan, magenta, yellow) while the second sheet could be any colour, as listed in the second table. The resulting colour that is seen give information on colour composition and the subtractive synthesis.

SECONDARY COLOURS AND SUBTRACTIVE SYNTHESIS			
Experiment with white light and coloured filter			
1° foglio	Cyan	Magenta	Yellow
2° foglio			
Red			
Verde			
Blue			
Cyan			
Magenta			
Yellow			

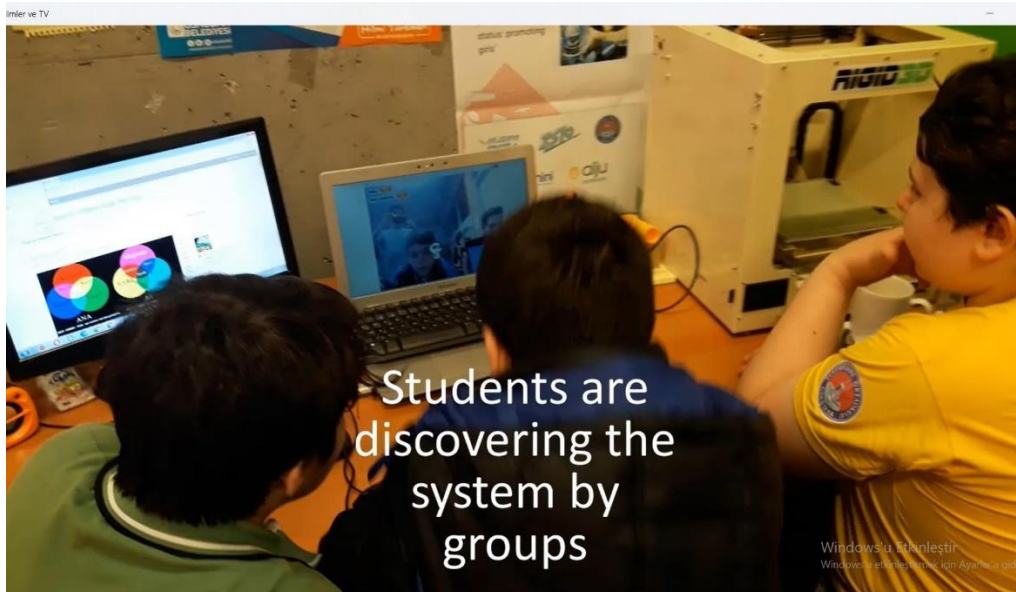
## Phase 2. Colours Challenge

Step 1. In appInventor we have developed a simple application: a uniform background is shown.

When the phone is shaken, the program changes the screen colour to a random one.



Step 2: Students learn how to use the program.



Step 3. We choose the questions to teach colours.

```
define soru5
say What color is formed if we mix red with yellow?(Light Colors) for 10 secs
if touching color [red] ? then
run forward at speed 100
play drum 1 for 0.25 beats
set led on board all red 0 green 150 blue 0
wait 1 secs
run forward at speed 0
say Right Answer! for 2 secs
else
set led on board all red 150 green 0 blue 0
run backward at speed -50
say Wrong Answer! for 2 secs
blok

define soru10
say What color is formed if we mix green with red?(Paint colors) for 10 secs
if touching color [red] ? then
run forward at speed 100
play drum 1 for 0.25 beats
set led on board all red 0 green 150 blue 0
say Right Answer! for 2 secs
wait 1 secs
run forward at speed 0
else
set led on board all red 150 green 0 blue 0
run backward at speed -50
say Wrong Answer! for 2 secs
blok

define soru6
say Which is main color
if touching color [red] ? then
say Right Answer!
run forward at speed 100
play drum 1 for 0.25 beats
set led on board all red 0 green 150 blue 0
wait 1 secs
run forward at speed 0
else
say Wrong Answer!
run backward at speed -50
```

Step 4. Competition starts



## Phase 3. Colours in Fashion



## Didactic proposal

- Colors matching

Defined primary, secondary, tertiary, etc. there are different theories for the correct matching of colors in fashion, art, etc.

### Quick & Easy Color Combinations

because the other one was pretty bad lol!



## The code

In the mBlock compiler, we find, in the "Sensing" group, the instruction "turn video on" that uses the webcam image as the background of the stage. We also find the "touching color" statement which returns true or false depending on whether the color of the stage, corresponding to the sprite, coincides or not with the color set in the instruction.

To set the color in the instruction you can click on the "color square" of the "touching color" instruction and then click on the point of the stage which you want to map the color to.

Depending on the color of the stage (webcam) at the sprite a different "broadcast" message is launched to the other sprite of the program.







x: 240 y: 44



M-Panda

Car-Bug

top

prop:



- Sound
- Pen
- Data&Blocks
- Sensing
- Operators
- Robots

```
touching [ ] ?
touching color [ ] ?
color [ ] is touching [ ] ?
distance to [ ]

ask "What's your name?" and wait
answer

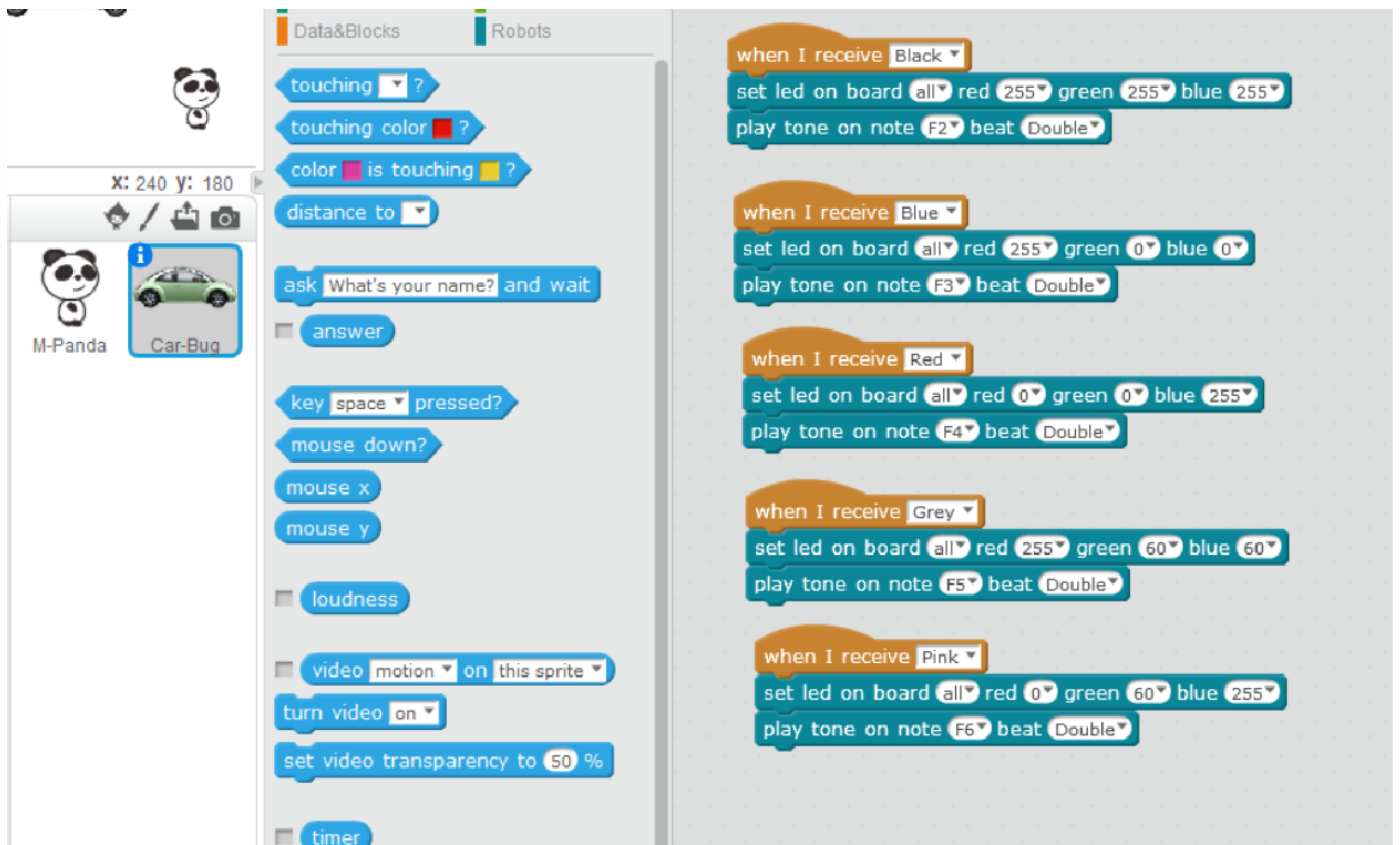
key space pressed?
mouse down?
mouse x
mouse y

loudness

video motion on this sprite
turn video on
set video transparency to 50 %

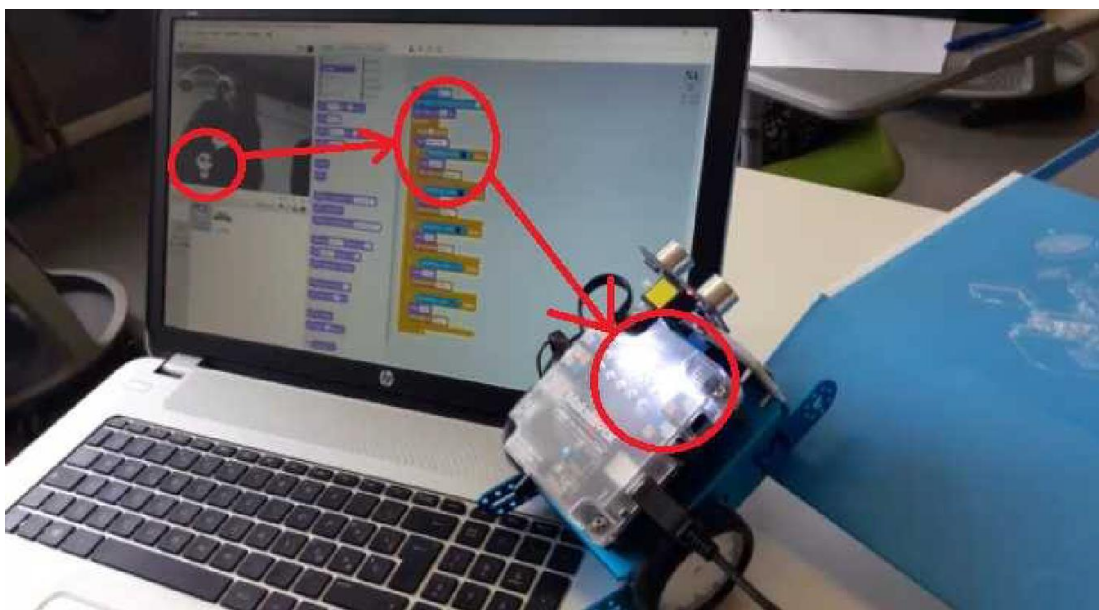
timer
reset timer
```

```
turn video on
set video transparency to 0 %
set size to 60 %
forever
  wait 1 secs
  say wait for...
  if touching color [ ] ? then
    say Black
    broadcast Black
  if touching color [ ] ? then
    say Blue
    broadcast Blue
  if touching color [ ] ? then
    say Red
    broadcast Red
  if touching color [ ] ? then
    say Grey
    broadcast Grey
  if touching color [ ] ? then
    say Pink
    broadcast Pink
```



Another 5 program blocks wait for the broadcast message corresponding to your color to be launched. In this case it will activate the onboard LED with a color well matched to the one identified. To improve the sensation of operation, a different sound is also emitted for each color.

### Photos from the activity



## STUDENT'S EVALUATION

To report on this activity and give marks to your students you may use the Evaluation guide designed for the project. Useful indicators specific for this activity include:

- ❖ Development of algorithm.
- ❖ Function of the eye.
- ❖ RGB technology for colour generation.
- ❖ Colour matching items.

## SCALABILITY

Suitable for students at beginning of high school or at intermediate secondary school (14-16 years). We also played the activity with younger students (12-14 years) but skipping part 1.

