



## Creative Programming with TurtleStitch

Learners Create Embroidery Designs and Learning Materials

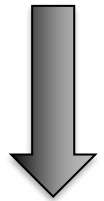
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Before We Start

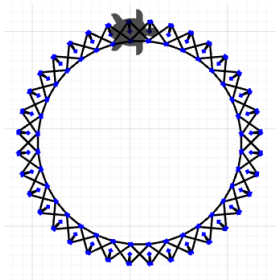
## Principle of Programming with TurtleStitch

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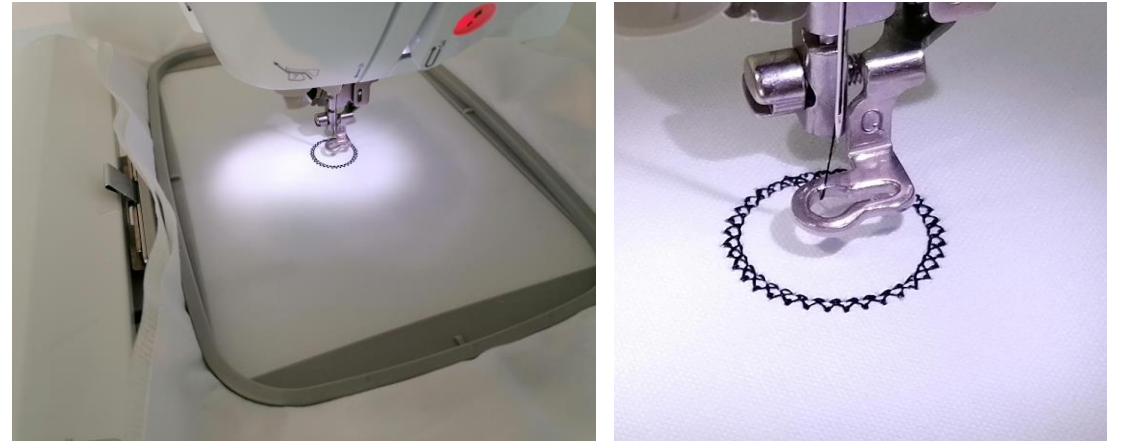
- Block-based programming



- See direct results on screen



- Stitch your pattern for physical result



- Export your program



## Agenda

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- About us
- Report on project days with students
- Creative phase
  - Short demonstration of TurtleStitch basics
  - Follow the students' instructions from learning cards (beginner's cards)
  - Discussion and reflection of students' work
- Brush up



Run TurtleStitch!

Source: [turtlestitch.org](http://turtlestitch.org)

## About us

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- Schwyz University of Teacher Education, Institute of Media and School (IMS)



- Prof. Dr. Mareen Przybylla: Head of Endowment Professorship in Computer Science Education (Secondary School Level)



- Beat Horat: Junior Researcher in Computer Science Education

### **Project at Partner School**

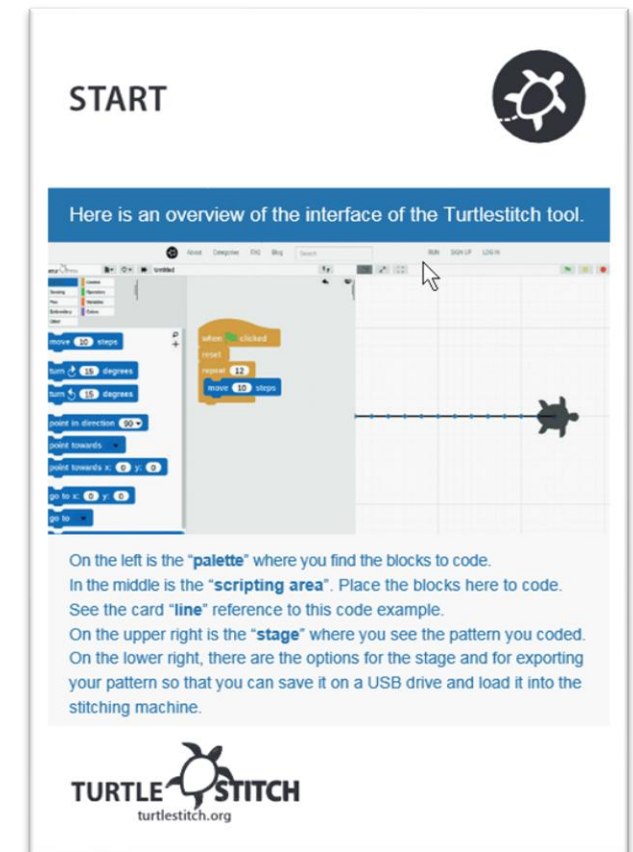
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- Project days at “Sek Eins Höfe”
  - Partner school that is often in contact with us
  - Two days with variety of different topics and workshops
  - Creative event to introduce the summer break
  
- Programming workshops
  - Opportunity to teach programming with TurtleStitch
  - One class of lower secondary school students (14 year old)
  - Entire class assigned to the workshop; no mixing of classes due to Covid
  - Split in two groups of 9 and 8 students respectively, one full day per group
  - Me as presenter, Mareen and class teacher helping out for questions and coaching

## Process of TurtleStitch Workshops

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- Agenda for each group (one workshop day)
  - Morning program
    - Introduction with examples
    - Free hands-on training time with support of teachers
    - Further input sequences in between
  - Afternoon
    - Choose an individual project
    - Stitch the project (supervision of teachers)
    - Create learning card that comments and explains the project based on the examples of TurtleStitch Beginner Cards



Source: turtlestitch.org

## Why Learning Cards?

- Original learning cards are a nice way to explain TurtleStitch
- Provide a stage for the students to show their project
- See what the students fully understood and could explain in their own words

**START**

The most important blocks are:

- when clicked** ← "Green Flag" marks the start of the code and executes it when clicked.
- reset** ← "Reset" clears the stage and sets the pen back to the default position, very useful when you re-run a pattern while testing it.

Now you can start designing your pattern. Examples are on the other cards.

**Design issues:**

- Not everything that can be coded can be stitched. Try to avoid too many stitches on the same spot, the fabric might tear.
- Don't forget to think about stitch length. You can experiment with stitch length when you refer to card "line".

Here is an overview of the interface of the Turtlestitch tool.

On the left is the "palette" where you find the blocks to code. In the middle is the "scripting area". Place the blocks here to code. See the card "line" reference to this code example.

On the upper right is the "stage" where you see the pattern you coded. On the lower right, there are the options for the stage and for exporting your pattern so that you can save it on a USB drive and load it into the stitching machine.

Source: [turtlestitch.org](http://turtlestitch.org)

**TURTLE STITCH** schwyz university of teacher education

Project Name: "Flower"

In this beginner's card, we learn how to stitch a flower.

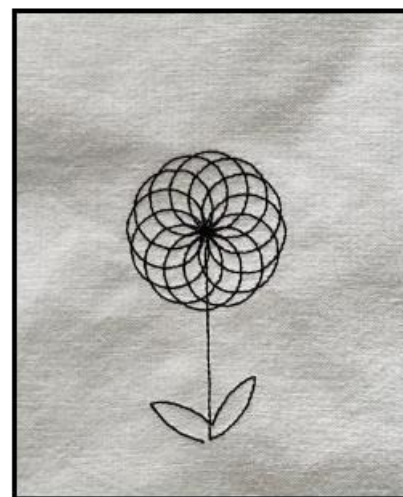
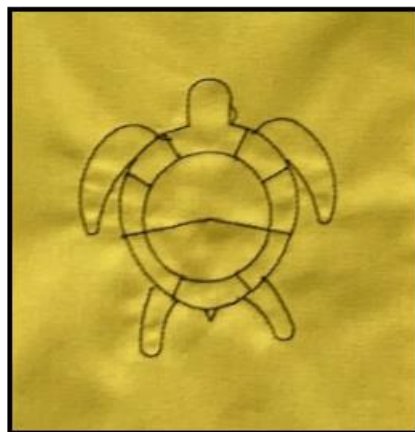
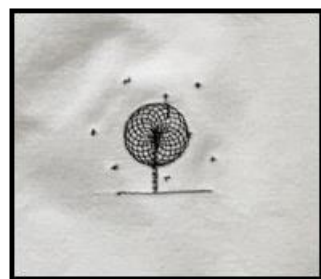
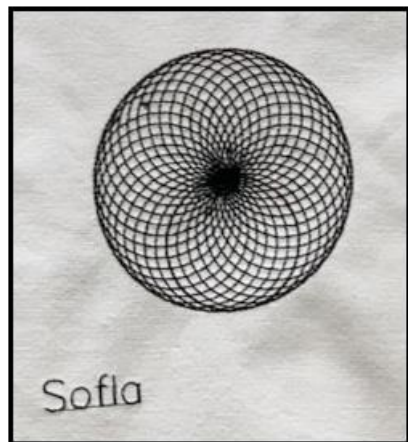
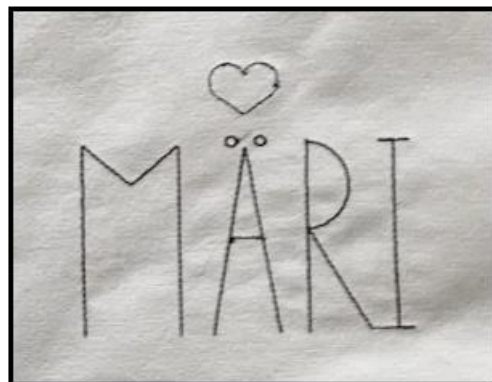
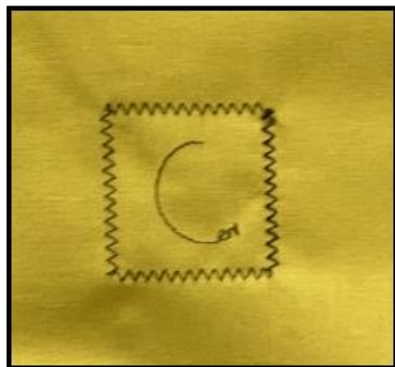
This is my TurtleStitch code:

**Description of your code:**

- 1. Start: I start the program when I click on this block.
- 2. Triple run: The stitch I chose for the stitching machine.
- 3. Jump stitch: The needle does not stitch from here...
- 4. Go to: ... and jumps to the defined position.
- 5. Create circles: I stitch 12 circles, using a 30° offset to arrange the circles in a blossom form.
- 6. Create the stem: The following blocks stitch the stem.
- 7. Stitch the leaves

**What is special about my project?**

I liked that we could develop a project of our own. There was nothing really difficult about it.





# Project Days

## Learning Materials

### • Workbook for TurtleStitch

schwyz university of teacher education



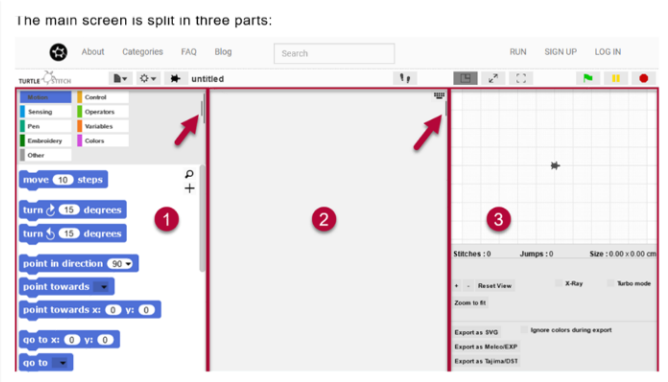
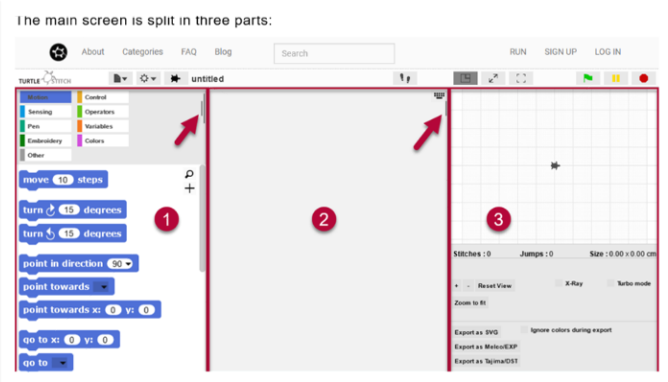

**TurtleStitch Workshop – Introductory Workbook for Students and Educators**

**1 Introduction**

This introductory manual shall provide students and educators an overview of the software and its possibilities.

TurtleStitch is a block-based programming language that can be used to create patterns and figures. Therefore, you do not need to learn complicated code but instead the fun part of programming!

Using TurtleStitch, you can design a multitude of forms and figures. For example, this code (left screenshot) creates the respective pattern on the screen (middle screenshot), which can finally be embroidered on fabric using an embroidery machine (right screenshot).



### • Manual for embroidery machine

pädagogische hochschule schwyz

**TurtleStitch Projekttag – Beschreibung der Stickmaschine**

**1 Einleitung**

Während den Projekttagen mit TurtleStitch verwenden wir die unten abgebildete Stickmaschine «Brother Innov-is 750E»:



# Introducing TurtleStitch

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- Introductory workbook for TurtleStitch
  - Used as reference guide during workshops
  - Works as self-learning program for students and educators
  - Examples based on learning cards, similar in style
  - Detailed and quite long, so only extracts demonstrated today
- Currently available in English and German
  - <https://mia.phsz.ch/Informatikdidaktik/TurtleStitch>

# Introducing Embroidery Machine

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- Introductory manual for embroidery machine
  - We used “Brother Innov-is 750E” machines
  - *This is not an assessment of any kind; we are just sharing information 😊*
  - Other presenters might have more experience with embroidery machines
- Note on our workshop setting
  - Stitching was managed entirely by teachers mainly for safety reasons
  - Reserve more time when students need to be instructed to embroidery machines
- Currently only available in German
  - <https://mia.phsz.ch/Informatikdidaktik/TurtleStitch>



## Stitching Material

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- Suitability of different materials depends heavily on embroidery machine
- Our experience on material for “Brother Innov-is 750E” is included in the machine manual
- In a nutshell
  - Use **thin but ‘stable’ fabric** such as cotton, stretchable fabric would increase difficulty level significantly
  - Always using **stabilizer fleece**, enhances precision of embroidery
  - **Bobbin thread** is different from **embroidery thread** 😊
- A lot of practice necessary
  - Allow for trial-and-error time... and do not start with your favorite shirt 😊
  - Learn to know the embroidery machine and the material used

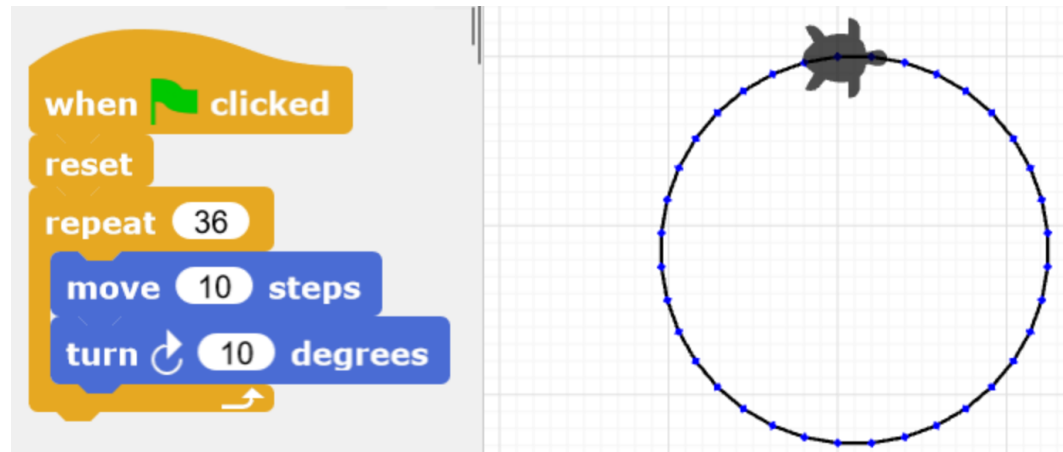


## Creative Phase

### Demonstration of TurtleStitch Basics (1)

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- Live demo: Very brief, but there is more detail in the manual and feel free to ask questions
- Navigate to [www.turtlestitch.org](http://www.turtlestitch.org)
- Welcome page vs. “RUN”
- Palette / Coding Area / Stage
- Most important blocks
  - “move n steps”
  - “reset”
  - “when ‘green flag’ clicked”
  - “repeat n”
  - “turn n degrees”

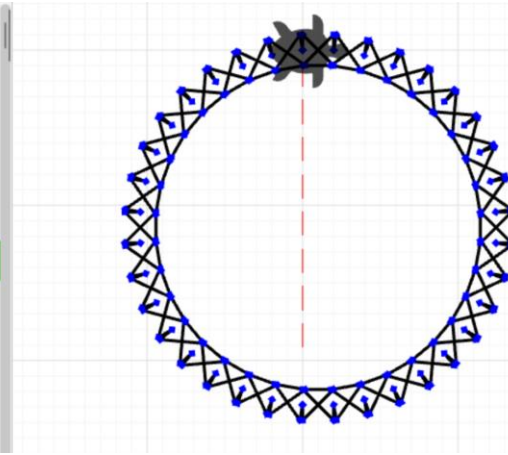


## Creative Phase

### Demonstration of TurtleStitch Basics (2)

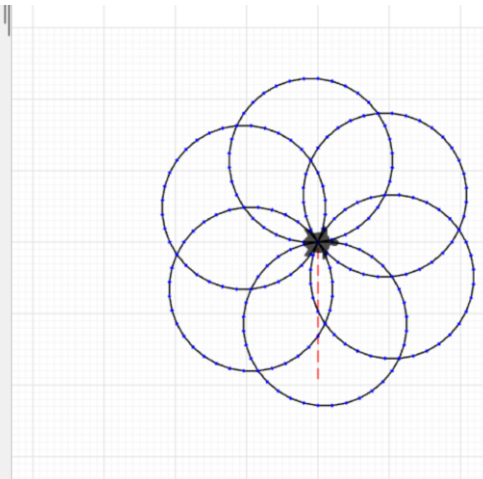
- Choose embroidery settings
- Jump stitches

```
when clicked
  reset
  jump stitch ✓
  go to x: 0 y: 100
  jump stitch ✗
  cross stitch in 10 by 10 center ✓
  repeat 36
    move 10 steps
    turn 10 degrees
```



- Personal blocks
- Variables

```
when clicked
  reset
  set circle_count to 6
  jump stitch ✓
  go to x: 0 y: 100
  jump stitch ✗
  running stitch by 10 steps
  repeat circle_count
    circle
    turn 360 / circle_count degrees
```



## **Examine Students' Learning Cards and Codes (1)**

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- **Group work in breakout rooms (approximately 20 minutes)**
- Find the material here <https://mia.phsz.ch/Informatikdidaktik/TurtleStitch>
  - Learning cards and code from six student projects
  - Instructions as seen here
  - Questions for discussion

*What was easy to understand for us, what was difficult?*

*Where did the students have problems?*

*Was the explanation on the students' learning cards sufficient?*

*Did you spot anything special in the cards or the code?*

*Which advise would you give the students to improve the description on their card?*

## Creative Phase

### **Examine Students' Learning Cards and Codes (2)**

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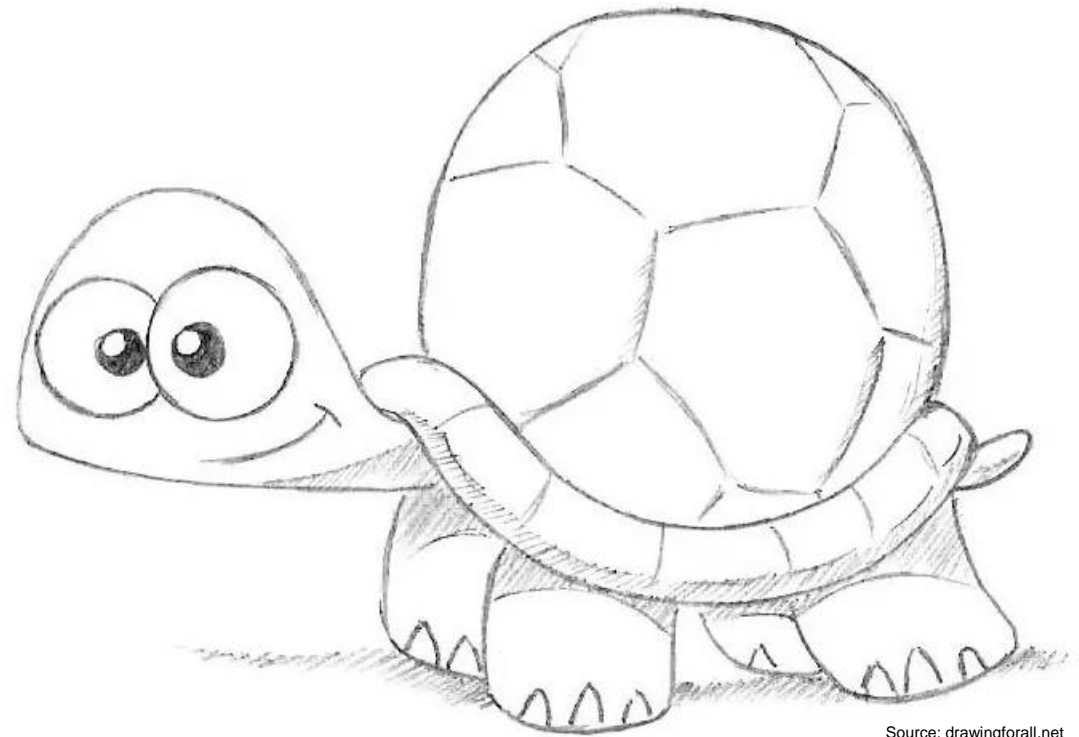
- **Group work in breakout rooms (approximately 20 minutes)**
- Breakout Room 1 works with material from project 01 and so on
- Follow the student's instructions to build the project and understand the code
- You can drag and drop the code (xml file) to turtle stitch if you like
- When finished, you can examine other projects individually (lower project numbers = easier)



Creative Phase

## Ready for Breakrooms?

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Source: drawingforall.net

### **Discussion**

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- What was easy to understand for us, what was difficult?
- Where did the students have problems?
- Was the explanation on the students' learning cards sufficient?
- Did you spot anything special in the cards or the code?
- Which advise would you give the students to improve the description on their card?

# Brush Up Questions?

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## Lessons Learned (1)

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- Keep demo phases short
- Students profit significantly more when they creatively try whatever is on their mind
- **In our workshop**, some students seemed to be not interested...
  - Turned out that most of them were just insecure
  - Especially girls tended to express insecurity about coding and commented accordingly in the learning cards
  - However, the girls' overall results turned out more creative, more accurate and showed a much higher degree of understanding the code than compared to most of the male students

## Lessons Learned (2)

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- Handling the embroidery machines took up more teacher time than answering coding questions
- Try to involve advanced, diligent, careful students into machine handling
- When you an entire day, split into several sequences with new challenges each
- Exporting data to memory stick was a challenge for some students
- Diverse level of previous CS knowledge, further highlight the importance of creative phase so everybody can profit

```
when clicked
  reset
  running stitch by 10 steps
  draw text Thank you with size 1
  jump stitch ✓
  go to x: 0 y: -30
  jump stitch ✗
  draw text very much with size 1
  jump stitch ✓
  go to x: 0 y: -60
  jump stitch ✗
  draw text for your with size 1
  jump stitch ✓
  go to x: 0 y: -90
  jump stitch ✗
  draw text attention! with size 1
```

