Spring 4-30-2018

CODE4her Spring 2018

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CODE4HER SPRING 2018

Rebeccah Knoop

HONORS PROJECT

Submitted to the Honors College
at Bowling Green State University in partial fulfillment
of the requirements for graduation with UNIVERSITY HONORS

April 30 2018

Jadwiga Carlson, Department of Computer Science, Advisor
Sarah Rainey, Department of Women's, Gender and Sexuality Studies, Advisor
Introduction

The development and execution of the CODE4her Spring 2018 session served as the Honors Project of Rebeccah Knoop. Goals of the project included:

- Purchase new Sphero SPRK+ robots
- Design activities that can be repeated in future CODE4her sessions.
- Increase resources that would allow for future opportunities to host workshops and programs of different locations, lengths, and skill levels.

In addition to planning the activities, each meeting was facilitated and presented by Rebeccah Knoop. The purpose of this report is to describe the details of the session, and to act as a tool for future CODE4her leaders who are repeating the activities.
CODE4her is a mentorship program with a goal of sparking interest in computer science organized by the BGSU Women in Computing (BGWIC) student organization. Participation is open to middle school girls (grades 5-8), and participants are paired with BGWIC members who serve as mentors.

Two CODE4her sessions occurred prior to Spring 2018, taking place Spring 2017 and Fall 2017. These sessions taught programming fundamentals using Lego Mindstorms EV3 robots. This session is the first to use Sphero robots.

**Program Goals**

**For participants**
- Provide an opportunity to learn computer science principles through hands-on and active learning.
- Encourage teamwork and communication by working collaboratively on projects.
- Increase self-confidence through exposure to an empowering, inclusive learning environment and positive role models.

**For mentors**
- Provide an opportunity to get involved on campus and in the community
- Encourage the sharing of knowledge which increases sense of self-worth and confidence.
- Encourage leadership, communication, and personal responsibility
- Foster collaboration with other computer science students
- Increase personal satisfaction with the college experience

**For the BGSU Computer Science Program**
- Improve students’ satisfaction with the program
- Provide an opportunity to get more students involved
- Retain students by creating a more positive experience
- Increase program visibility through community outreach
- Promote collaboration and sense of community within the CS program

## Participation

### Program leaders
One BGSU faculty member served as the program coordinator.
One undergraduate BGSU student served as the mentor lead.

### Mentors
Seventeen BGSU students served as mentors for the program. Mentors were selected by the program coordinator. Mentors attended an orientation and signed an agreement (see Additional Documents) prior to the program start.

### Mentees
Thirty-four girls participated in the program.

## Resources

### Sphero SPRK+ robots
17 Sphero SPRK+ robots were purchased from Sphero at a discounted price of $100 each, $30 less than the regular price of $130 each. Each Sphero came with additional materials, including a protractor, stickers, and a roll of blue tape.

### iPads
Twenty iPads were donated by BGSU Information Technology Services free of charge. The free Sphero Edu app to program the robots was installed on each iPad.

### Room Setup
Each CODE4her meeting took place at Bowling Green State University in Olscamp Hall room #225. The room was reserved free of charge.

Room features:
- 90-person capacity
- 30 tables with a dry-erase surface
- Dry-erase walls
- 4 TVs
- 2 projectors
- Microphone
- Computer

Additional materials
- 30 dry-erase markers (Purchased)
- 10 erasers (Purchased)
- Mentor name tags (Printed by program coordinator)
- Mentor lanyards (Purchased)
- Team station signs (Printed by program coordinator)
- Snacks (Purchased)
- Giveaways (Donated by local companies)
  - Water bottles
  - Pens
  - Stickers
- Mentor polo shirts (Purchased)
Planning

**Sphero Edu**
When planning activities, the main focus was teaching programming concepts in a fun environment. Many factors had to be taken into consideration:

- length of each meeting
- skill level of the participants
- goals of the program
- capabilities of the robots

Many activity ideas came from the Community section of the Sphero Edu app, where any user can share the activities and programs they create.

A Sphero educator account was created in the Sphero Edu app. Educators can create classes and assign activities. A class was created with 17 students so that each team had their own account.

**Meeting Preparation**
Robots and iPads were plugged in at least a day before each meeting to charge.

The program coordinator purchased snacks in bulk before the meeting.

Mentors arrived half an hour early to set up team stations and activities.

**Session Overview**

An overview of the activities completed at each meeting is included below. Each activity includes an estimated duration. Sphero activities are listed as they appear in the app. All Sphero activities can be accessed at: [https://edu.sphero.com/cwists/category#searchTerm=code4her](https://edu.sphero.com/cwists/category#searchTerm=code4her)

Outcomes of each activity are listed in the Activity Descriptions.

Notes were recorded at each meeting and should be taken into consideration when implementing the activities in future CODE4her sessions.
Meeting 1 - January 21

<table>
<thead>
<tr>
<th>Activity</th>
<th>Sphero Activity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welcome/set up</td>
<td></td>
<td>15 min.</td>
</tr>
<tr>
<td>Icebreaker</td>
<td></td>
<td>15 min.</td>
</tr>
<tr>
<td>Overview of Sphero App</td>
<td></td>
<td>20 min.</td>
</tr>
<tr>
<td>1.0 - Pre-program survey</td>
<td></td>
<td>15 min.</td>
</tr>
<tr>
<td>1.1 - Your first program!</td>
<td></td>
<td>15 min.</td>
</tr>
<tr>
<td>Snack break</td>
<td></td>
<td>15 min.</td>
</tr>
<tr>
<td>1.2 - Square with Loops</td>
<td></td>
<td>25 min.</td>
</tr>
<tr>
<td>1.3 - Lights and Sound</td>
<td></td>
<td>25 min.</td>
</tr>
<tr>
<td>Challenge - Draw any shape</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Activity Descriptions**

**Icebreaker**
- Interviews. Mentees are given 5 minutes each to interview each other, and then 5 more minutes to interview their mentor. The have to learn the other’s name and 3 fun facts about the person. Afterwards, they introduce each other to the other people at their table.

**1.0 - Pre-program survey**
- Each mentee took the survey on the iPads. (See results below in Mentee Pre-survey section)

**1.1 - Your first program**
- Use a roll block to make Sphero move
- Learn basics of block programming interface
- Use a delay block to make the program pause

**1.2 - Square with loops**
- Use a loop to refactor a program
- Use an operator to increment a value

**1.3 - Lights and sound**
- Program Sphero to light up and make sounds

**Challenge - Draw any shape**
- Apply concepts from activities 1.1 and 1.2 to recreate any shape
Notes
Have mentors leave the room during the survey
Need another activity or challenge for this meeting as many finished early.

Meeting 2 - February 18

<table>
<thead>
<tr>
<th>Activity</th>
<th>Sphero Activity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welcome/set up</td>
<td></td>
<td>10 min.</td>
</tr>
<tr>
<td>2.0 - Create your team flag</td>
<td></td>
<td>15 min.</td>
</tr>
<tr>
<td>2.1 - Time, Speed, and Distance</td>
<td></td>
<td>15 min.</td>
</tr>
<tr>
<td>2.2 - Curves and Circles</td>
<td></td>
<td>15 min.</td>
</tr>
<tr>
<td>Snack break</td>
<td></td>
<td>15 min.</td>
</tr>
<tr>
<td>Opening Ceremony</td>
<td></td>
<td>5 min.</td>
</tr>
<tr>
<td>Curling</td>
<td></td>
<td>20 min.</td>
</tr>
<tr>
<td>Skiing</td>
<td></td>
<td>20 min.</td>
</tr>
<tr>
<td>Figure Skating</td>
<td></td>
<td>20 min.</td>
</tr>
<tr>
<td>Challenge - Create the Olympic Flag</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Activity Descriptions

2.0 - Create your team flag
- Each team works together to design a flag to represent them in the CODE4her Olympics

2.1 - Time, Speed, and Distance
- Learn about the relationship between time, speed, and distance
- Learn about independent and dependent variables

2.2 - Curves and Circles
- Use a spin block to make Sphero roll in curved lines and circles

Opening Ceremony
- Pass the Olympic “flame” from one Sphero to the next using an On Collision event

Curling
- Roll as close to a target as possible

Skiing
- Navigate a ski course with gates and ramps

Figure Skating
- Showcase your programming skills with a choreographed routine
Challenge - Create the Olympic Flag
- Program Sphero to visually recreate the Olympic Flag

Notes
Mentees really enjoyed the competition aspect of this meeting. Consider integrating more competition into future activities.

Skiing activity was too hard and could not be completed in 20 minutes. Ramps should be removed from the course as Sphero could not accelerate enough to make it over.

Curling area was too crowded; need multiple targets.

Could have had Closing ceremony at end of meeting similar to Opening Ceremony.

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Meeting 3 - March 18

<table>
<thead>
<tr>
<th>Activity</th>
<th>Sphero Activity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welcome/set up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Icebreaker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0 - Martian Messages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1 - Self-driving Rover</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2 - Meteor Shower</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snack break</td>
<td></td>
<td>15 min.</td>
</tr>
<tr>
<td>3.3 - Alien Invasion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.4 - The Solar System</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Activity Descriptions

**Icebreaker**
- Lines and Groups

**3.0 - Martian Messages**
- Learn about the hexadecimal numbering system
- Create a hex encoder to send messages in hexadecimal

**3.1 - Self-driving Rover**
- Program Sphero to be self-driving
- Use an On Collision event to program Sphero to react to a collision with another object

3.2 - Meteor Shower
- Simulate a meteor falling
- Use events to detect when Sphero is in freefall or landing

3.3 - Alien Invasion
- Simulate an alien invasion
- Use a collision event to simulate the spread of a virus

3.4 - The Solar System
- Model the solar system using Spheros as planets

Notes
Set aside time at the end of Alien invasion for every team to run their program simultaneously.

The robots were not charged prior to the start of the meeting, and about 20 minutes had to be taken for them to charge. The solar system activity could not be completed during this meeting.

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**Meeting 4 - April 8**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Sphero Activity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welcome/set up</td>
<td></td>
<td>10 min</td>
</tr>
<tr>
<td>Icebreaker</td>
<td></td>
<td>15 min</td>
</tr>
<tr>
<td>3.4 - The Solar System</td>
<td></td>
<td>20 min</td>
</tr>
<tr>
<td>Songwriting</td>
<td></td>
<td>10 min</td>
</tr>
<tr>
<td>4.0 - Morse Code</td>
<td></td>
<td>45 min</td>
</tr>
<tr>
<td>Snack break</td>
<td></td>
<td>15 min</td>
</tr>
<tr>
<td>4.1 Treasure Hunt</td>
<td></td>
<td>20 min</td>
</tr>
</tbody>
</table>

**Activity Descriptions**

**Icebreaker**
- Get-to-know-you Bingo
- Instructions

**Songwriting**
- Sing “I'm a Nut” to show how the chorus of a song is like a function in a program
- Video

**4.0 - Morse Code**
- Learn how to communicate via Morse Code
- Learn about functions
- Program Sphero to send messages in Morse code
- Use functions to group blocks

4.1 Treasure Hunt
- Use functions to program basic movements
- Design a course and program Sphero to navigate it

Notes
Provide more materials that can be used to create a course for the treasure hunt activity.

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Meeting 5 - April 22

<table>
<thead>
<tr>
<th>Activity</th>
<th>Sphero Activity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welcome/set-up</td>
<td></td>
<td>10 min</td>
</tr>
<tr>
<td>5.0 - Bees!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snack break</td>
<td></td>
<td>15 min</td>
</tr>
<tr>
<td>5.0 - Bees!</td>
<td></td>
<td>5 min</td>
</tr>
<tr>
<td>Award Ceremony</td>
<td></td>
<td>15 min</td>
</tr>
<tr>
<td>5.1 - Post-program survey</td>
<td></td>
<td>10 min</td>
</tr>
</tbody>
</table>

Activity Descriptions

5.0 - Bees!
- Learn how bees pollinate flowers
- Program Sphero to simulate bee behavior
- Compete to make Sphero “pollinate” as many flowers as possible

Award Ceremony
- Mentees and mentors were awarded certificates

5.1 - Post-program survey

Notes
Due to the imprecise movements of Sphero, it was difficult to program it to navigate a course as the measurements would be off a little bit each time. Mentees wanted to just drive Sphero from flower to flower as programming it was very difficult. Rethink the bees activity to account for slight changes in movement.
Implementing Future Sessions

All materials from this session, including presentations for each meeting, surveys, mentee certificates, and other supplemental materials, have been collected in a shared Google drive folder. Future program leaders will be given access to this folder as well as login information for the Sphero Edu app. This will enable them to directly access and edit all activities created for this session, create new classes, and assign activities to future participants.

One of the downfalls of this session is that we only had 17 robots to be used by 17 teams. If a robot wasn’t working or wasn’t charged, there was no backup robot to use, and teams had to share. The purchase of more robots would help alleviate these problems.

We also did not anticipate that some mentees would come into the program with prior knowledge of the robots as some of them own their own personal robot. If mentees could be matched by their familiarity with the Sphero robots, this could avoid the problem of a mentee who is very skilled with the Sphero robots being paired with someone who is a beginner.

Mentee Pre-survey

Have you ever learned computer science in any of the following ways?  
Check all that apply.

35 responses

1. Taking a computer science class at my school  
2. Learning on my own  
3. Learning with a sibling, parent, or friend  
4. Attending an extracurricular program (camp, after school club, etc.)
5. Online through a website, online course, and/or online community
6. This is my first time learning computer science

Does your school offer computer science classes?
35 responses

![Pie chart showing the distribution of responses regarding school offering of computer science classes.]

What do you hope to learn in CODE4her?

How to code games
How to make really long programs shorter
Anything I possibly can in computer science.
I hope to learn about different kinds of robots and code.
Something new.
Anything interesting
I hope I learn how to use different kinds of machines on computers, learn how to use different kinds of robots, and have fun.
More about computer science
How to program better than I already can
How to program things a little bit more.
Coding with blocks and understanding the concepts of coding.
More about computers
How to work with computers.
I hope to learn to work better with technology.
How to use Sphero/SPRK+ (5)
How to code different robots
How to work with robots
How to control things like robots and computers
How to code (3)
Just learning about coding and robots and just having fun with it 😊😊😊
Learn with the robots and also learn how to write program instead of using the block program.
Mentee Post-survey

The instructions for activities were easy to understand.

30 responses

14 (46.7%)
15 (50%)

0 (0%)
1 (3.3%)
2 (0%)
3 (0%)
4 (0%)
5 (0%)

14
15
What could be improved?

Nothing (5)
More time for activities (4)
More competition (3)
The snacks (3)
Having more space (2)
I don’t know (2)
Different kinds of spheros
Making some of the projects easier to do with the aiming so then you could complete it instead of working on aiming the whole time.

Writing on the walls.

Amount of Spheros that could be used at a time. Sometimes multiple Spheros were out of battery. That forced groups together, and the more people, the more conflict.

The app was a little touchy and it was hard to use sometimes.

More 1 on 1 mentor and mentee learning experiences.

Nothing really needs to be improved except I do think people should have a period of time where people get to write out there ideas on the table but what do I know about being orderly I'm the queen of chaos 😇

I would do more creative challenges because some were fun and others were a little less enjoyable.

The difficulty of the challenges.

I would like it if there were specific explanations.

I think we could try to get to know the mentee's personalities a little bit more before we even start the classes. It is hard for me to work with people who aren't very serious about coding and trying new things, so I think we could try to pair the mentees with people like them. I understand this is a hard thing to achieve, but I think it would really help some people understand code more.

How do you plan to learn more about computer science after this program?

30 responses

1. Taking a computer science class at my school 9 (30%)
2. Learning on my own 14 (45.7%)
3. Online through a website, online course, and/or online community 17 (56.7%)
4. I want to continue learning, but I'm not sure how yet 4 (13.3%)
5. I'm not sure yet if I'll continue learning computer science 0 (0%)
6. I don't think I'll learn more about computer science after this program 1 (3.3%)
7. Other... 1 (3.3%)
I think I could study computer science in college.
20 responses

I would participate in CODE4her again.
20 responses

CODE4her taught me...
How to program the bots
How to use a robot and how to make it do things
That coding does not have to be hard.
How to program robots.
How to do many things with the sphero and morse code
How to use spheros and Lego robots
How to use a sphero
How to program my sphero.
How to program a sphero better than I already could. (I was pretty bad before this though...)
What functions are
That some things that are difficult you need to push through and you'll get it eventually
Lost of things about problem solving and how to code
How to program
A lot about circles like programming
A lot of things. For example, how to use functions.
Coding with blocks is harder than I anticipated.
How to code
It taught me about coding more in depth than other coding camps.
That computer science takes thinking and math to do.
How to program the robots and how not to program a robot.
That coding is a good thing to learn you learn from trial and arrear and much more
How to program a sphero with edu
More about angles, more about programming robots, more about spheros, and more about teamwork:)
CODE4her taught me how to program certain robots. It taught me about computer science. I learned about functions, morse code, and more!
A lot in fact so Much that I can’t name every thing
How to program a robot.
How to use teamwork and problem solve. It also showed me how a Sphero generally works, and how to use the different parts block coding in the Sphero program.
What coding is and if I might want to do more in the future.
How to work with Spheros and how to code.
That computer science isn't always reliable. If you try and use the same line of code to get your program to do the exact same thing over and over, it won't work. CODE4her taught me that sometimes, even in science, you have to keep trying and get creative to get to the outcome to wanted.

Links

All CODE4her Sphero activities can be found at:
https://edu.sphero.com/cwists/category#searchTerm=code4her

Website
http://code4her.org/

Facebook
https://www.facebook.com/code4her/
Twitter
https://twitter.com/CODE4her
Additional Documents
CODE4her Roles and Responsibilities

In order to make this program a success teamwork is necessary. Several leadership roles and related responsibilities have been created to support the program.

Program Coordinator

The Program Coordinator position is currently held by Jadwiga A. Carlson. Responsibilities of the Program Coordinator include:

- Obtaining necessary funds to support the program
- Soliciting students for mentor positions
- Advertising the program to ensure sufficient mentee enrollments
- Developing curriculum for program sessions
- Ordering mentor uniform shirts
- Purchasing materials and snacks for each meeting
- Supporting the mentoring activities by providing support to mentors during mentoring meetings
- Communicating with parents prior to each meeting and providing a recap after each mentoring meeting
- Developing marketing materials
- Maintaining CODE4her website (http://code4her.org)
Upperclassmen Lead

The Upperclassmen Lead position is currently held by ________________. Generally this position should be held by a student with Junior/Senior academic standing. It is expected that CODE4her Scholarship awardees are involved in this leadership role.

Responsibilities of the Upperclassmen Lead include:

- Acting as a role model in all their actions but specifically by attending each meeting, pitching in to set-up/tear-down, providing help and support to other mentors
- Organizing a training meeting for mentors prior to the start of a session
- Maintaining a roster of student mentors including contact information
- Creating forms for biographical submissions and photos of mentors
- Updating CODE4her Facebook and Twitter accounts
- Help in planning of CODE4her session activities

Underclassmen Lead

The Underclassmen Lead position is currently held by ________________. Generally this position should be held by a student with Freshman/Sophomore academic standing. It is expected that CODE4her Scholarship awardees are involved in this leadership role.

Responsibilities of the Underclassmen Lead include:

- Acting as a role model in all their actions but specifically by attending each meeting, pitching in to set-up/tear-down, providing help and support to other mentors
- Emailing all mentors reminders about upcoming mentoring meeting
- Keeping track of attendance at each mentoring meeting
- Obtaining drinks for each of the mentoring meetings
- Help in planning of CODE4her session activities
**BGWIC Liaison**

The BGWIC Liaison position is currently held by ________________. The CODE4her is a program organized by BGWIC Student Organization therefore generally the BGWIC Liaison position should be held by an officer of BGWIC. It is expected that CODE4her Scholarship awardees are involved in this leadership role. Responsibilities of the BGWIC Liaison include:

- Acting as a role model in all their actions but specifically by attending each meeting, pitching in to set-up/tear-down, providing help and support to other mentors
- Making BGWIC office available for storage of CODE4her related materials
- Facilitating reimbursements for expenses related to CODE4her meetings
- Soliciting students for mentor positions
- Help in planning of CODE4her session activities

**Mentor**

Generally the mentor position should be held by a student that is a CS major or minor or student in other closely related technical fields. Responsibilities of a Mentor include:

- Being prepared for the meeting which may include looking over the meeting’s activities ahead of time
- Setting up and tearing down the team station
- Being actively engaged with the mentees at each meeting
- Helping the Upperclassmen Lead, Underclassmen Lead, and the Program Coordinator as needed
Spring 2018 Mentor Agreement

Congratulations! By becoming a mentor, you are choosing to act as a positive influence in someone else’s life! You will serve as a role model, teacher, and trusted friend. Your commitment indicates a high level of responsibility, and we hope that you find this experience encouraging, inspirational, and personally fulfilling. Thank you for helping to inspire the next generation of computer scientists!

Program Details

- The Spring 2018 program will consist of 5 meetings, occurring from 1:30 - 4:00 PM on the following dates:
  - January 21
  - February 18
  - March 18
  - April 8
  - April 22

Mentor Expectations

- Attend EVERY meeting
- Arrive to meetings by 1:00 PM
● Stay until the room and all equipment has been returned to its original state/location
● Be in good academic standing with at least a 3.0 GPA in CS courses
● Respond to all (email and Slack) communication within 24 hours (excluding weekends)

Absences
● Mentors who miss a mentoring meeting without a valid reason will be dismissed from the program immediately
● Mentors who are dismissed will forfeit any end of program rewards or scholarships
● Exceptions will be made only for the most serious reasons such as illness, hospitalization, death in the family, or other emergencies.
  ○ If such an emergency arises, please contact jacarls@bgsu.edu AND knoopr@bgsu.edu as soon as possible.
    ■ Documentation will be required and expected upon return or within 3 days of missed meeting and submitted to program coordinator Jadwiga Carlson.

Being a mentor
● Mentors will be paired with two mentees to form a team over the course of the program
● Tips for working with your mentees
  ○ Be a friend
    ■ Be encouraging and use reassuring language. Compliment your mentees on their perseverance, hard work, and creativity!
- If your mentees become frustrated, reassure them that it's ok to struggle.
- Your mentees may be shy, quiet, or hesitant at first. Be patient and don't force it.
- Get to know your mentees and help them get to know you! Ask them about their hobbies and interests.
  - Be a role model
    - Stay off your phone and use appropriate language.
    - Don't be a distraction. When someone is presenting, be quiet, attentive, and direct your mentees' attention to the presenter.
    - If you don't know the answer, ask the program facilitator or mentor leader or another mentor for help!
  - Be a facilitator
    - Don't leave a mentee behind. Make sure each of your mentees have the opportunity to perform the tasks. If there are roles, ask the mentees to switch the roles half-way through the meeting so each gets a chance.
    - Adjust to the pace of your mentees. Some learners will take more time to grasp new ideas, and that's ok!
    - Don't just do things for them - work through it together.
Spring 2018 Mentor Agreement

I agree to serve as a mentor for the Spring 2018 CODE4her session. I have read and agree to follow the guiding principles of this mentor agreement.

Digital copy of this agreement can be found in the Google Drive CODE4her Spring 2018 training folder.

Print name

________________________________________

Signature

________________________________________

Date

________________________________________