COOL IT

Educating Talents – TLA: Learning through Individualization

COOL Lab – Barbara Sabitzer, Eva Schmidthaler

Johannes Kepler University, Linz, Austria, 13th of October 2023

Co-funded by the European Union

Overview

Introduction

COOL IT

Cooperative Open Learning & Computational Thinking for Everyone &

Learning through Individualization

Innovative Problem Solving

1. Discovery

2. Individuality

3. Cooperation

4. Activity

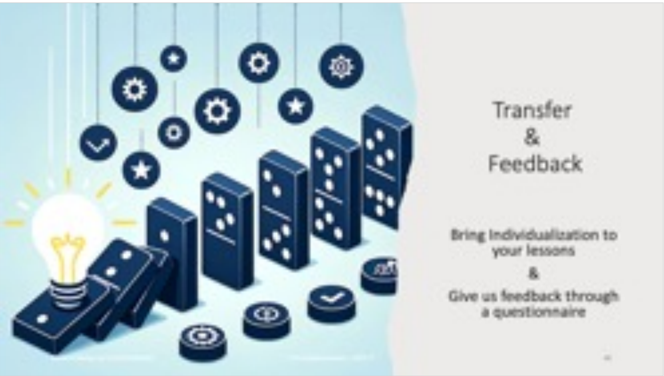
DICA - The 4 Principles in Detail

Learning Strategies & Tools

JKU COOL Lab – Best Practice

Discover – Experiment – Research – Develop

The innovative Teaching-Learning Lab for Digital Literacy & Computational Thinking



Transfer & Feedback

Bring Individualization to your lessons & Give us feedback through a questionnaire

Introduction

EDUCATING TALENTS

ERASMUS+

Educating Talents

Erasmus+ Project: Cooperation of 6 countries

Objectives: we want to empower teachers to prevent learners from becoming bored, underperforming or even dropping out of school.
These strategies will give talented learners the opportunity to reach their potential, and become capable of **creativity and innovation** for the greater benefit of Europe I

Activities:

- TLAs
- Create a community of practice around this theme.
- Interactive eHandbook containing
- Strategies for identifying talented students
- Strategies to improve awareness among educators that talented learners have special needs that must be taken into account.
- Dissemination

Erasmus+ APRECA Alfa-college Bildungsdirektion Oberösterreich SJÖLINS GYMNASIUM JKU COOL LAB WALLONIE-BRUXELLES ENSEIGNEMENT Co-funded by the European Union

Motivation Through Individualization

Motivation Through Individualization

Personalized Learning: Motivation Through Individualization emphasizes the importance of personalized learning plans for students. These plans take into account a student's learning preferences, strengths, weaknesses, and goals. (Hattie, J., & Donoghue, G. M. (2016). Learning strategies: A synthesis and conceptual model. npj Science of Learning, 1(1), 16013.)

Autonomy and Choice: Providing students with choices in their learning process is a fundamental aspect of individualization. When students have a say in what and how they learn, they are more likely to be motivated. (Deci, E. L., Vallerand, R. J., Pelletier, L. G., & Ryan, R. M. (1991). Motivation and education: The self-determination perspective. Educational psychologist, 26(3-4), 325-346.)

Interest-Based Learning: Tailoring instruction to match a student's interests can significantly enhance motivation. When students are studying topics they are passionate about, they are more likely to be engaged and motivated. (Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. Educational psychologist, 41(2), 111-127.)

Competency-Based Progression: Individualization often involves allowing students to progress at their own pace, advancing to the next level of difficulty when they have mastered the current material. This approach helps maintain motivation by preventing students from becoming bored or overwhelmed. (Kulik, J. A., & Kulik, C. C. (1991). Effectiveness of computer-based instruction: An updated analysis. Computers in human behavior, 7(1-2), 75-94.)

Motivation Through Individualization

Feedback and Reflection: Providing timely and constructive feedback to students helps them track their progress and make necessary adjustments. Reflective practices are essential for students to understand their learning journey and stay motivated. (Black, P., & Wiliam, D. (1998). Assessment and classroom learning. Assessment in Education, 5(1), 7-74.)

Technology and Personalization: Technology plays a crucial role in enabling individualization through adaptive learning platforms, personalized content recommendations, and data-driven insights into student performance. (Means, B., Toyama, Y., Murphy, R., & Baki, M. (2013). The effectiveness of online and blended learning: A meta-analysis of the empirical literature. Teachers College Record, 115(3), 1-47.)

Teacher Facilitation: Educators serve as facilitators and guides in the individualization process. They help students set goals, monitor progress, and adjust their learning strategies accordingly. (Tomlinson, C. A., & Allan, S. D. (2000). Leadership for differentiating schools & classrooms. ASCD.)

Intrinsic Motivation: One of the ultimate goals of individualization is to cultivate intrinsic motivation, where students are driven by their own curiosity and passion for learning rather than external rewards or pressures. (Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American psychologist, 55(1), 68-78.)

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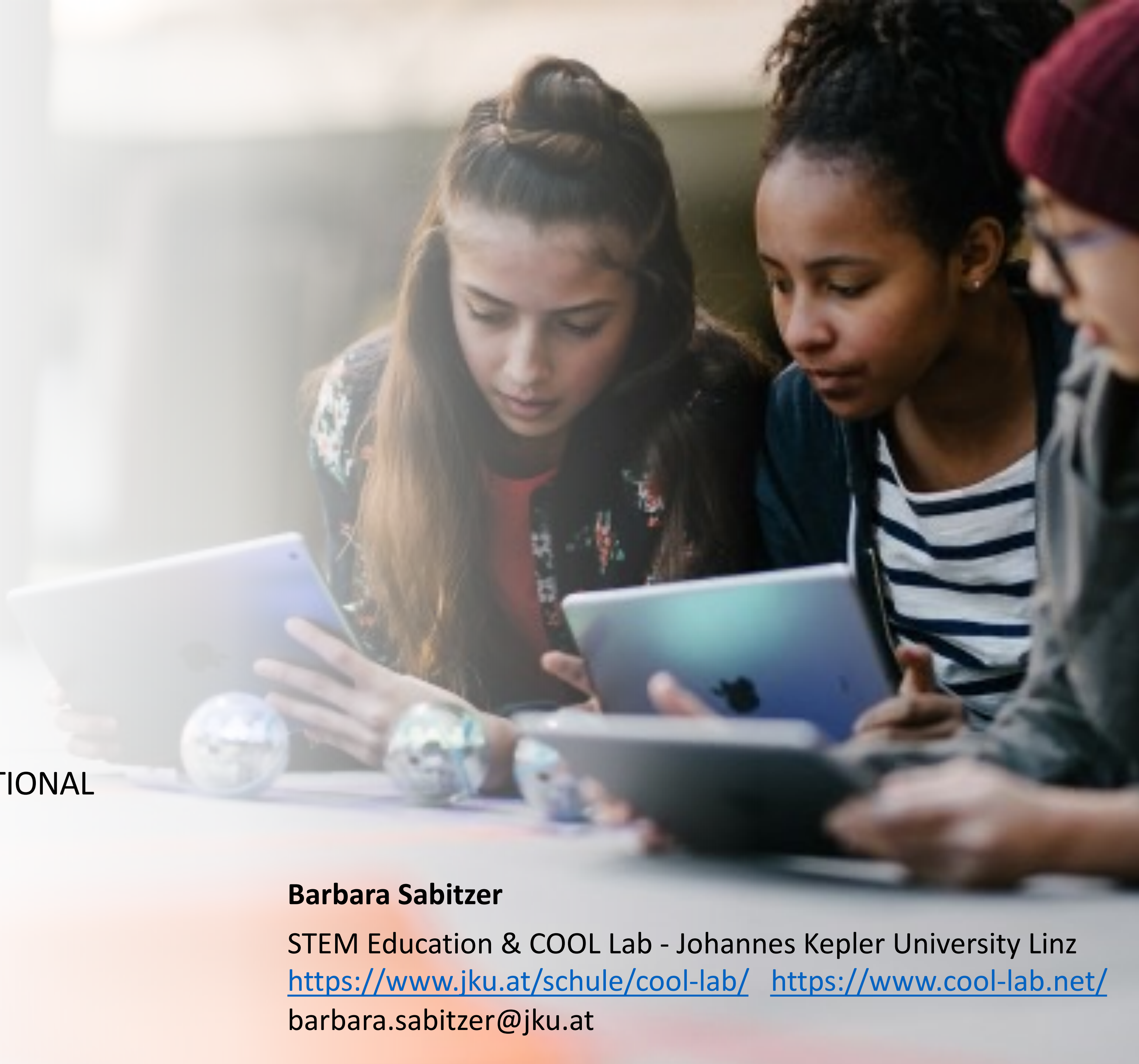
JOHANNES KEPLER
UNIVERSITY LINZ



COOL IT

COOPERATIVE OPEN LEARNING & COMPUTATIONAL THINKING FOR EVERYONE &

LEARNING THROUGH INDIVIDUALIZATION

INNOVATIVE PROBLEM SOLVING

Barbara Sabitzer

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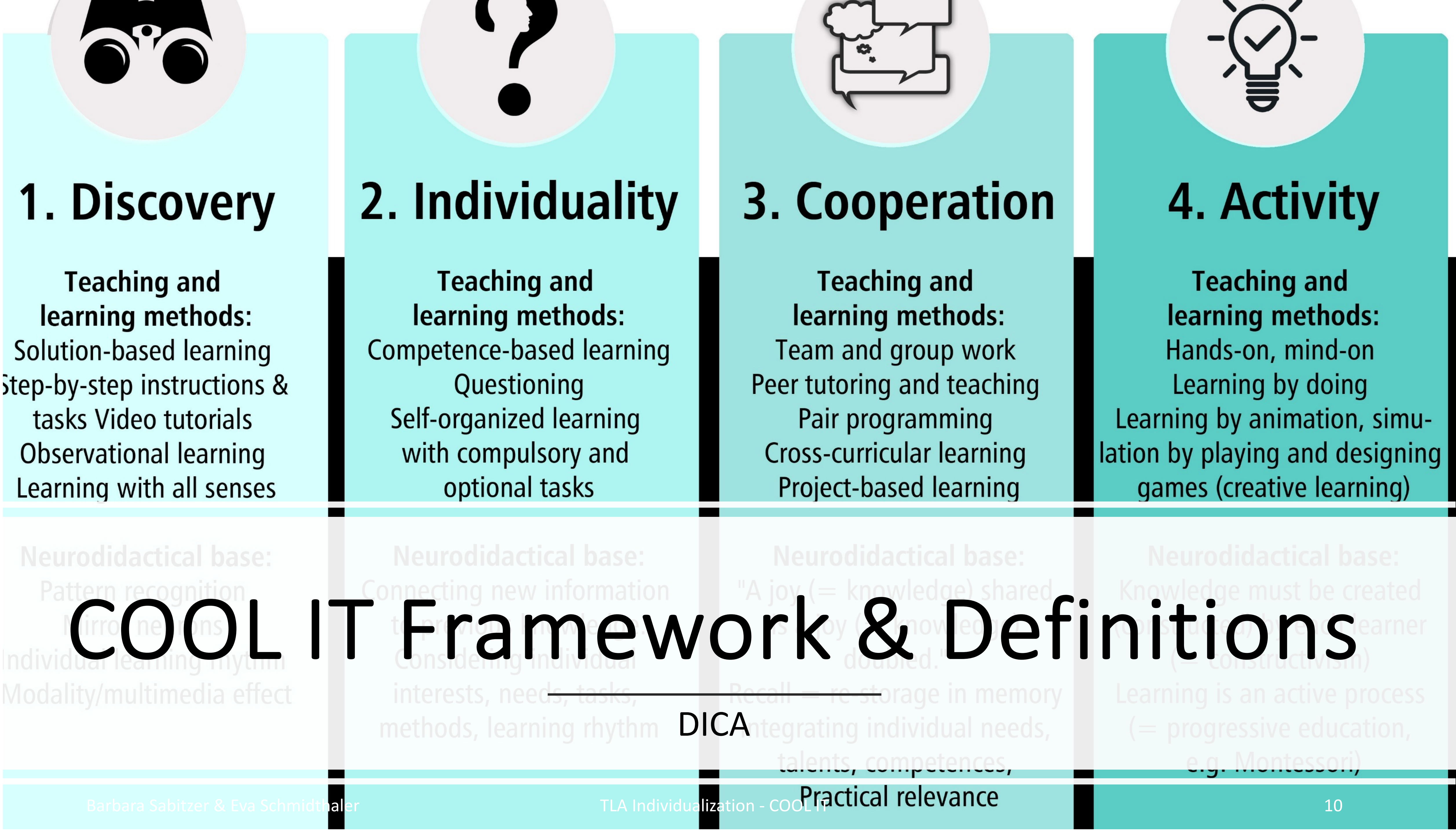
COOL IT Framework & Definitions

DICA



1. Discovery

Teaching and learning methods:
Solution-based learning
Step-by-step instructions & tasks Video tutorials
Observational learning
Learning with all senses

Neurodidactical base:
Pattern recognition
Mirror neurons
Individual learning rhythm
Modality/multimedia effect

2. Individuality

Teaching and learning methods:
Competence-based learning
Questioning
Self-organized learning with compulsory and optional tasks

Neurodidactical base:
Connecting new information to previous knowledge
Considering individual interests, needs, tasks, methods, learning rhythm

3. Cooperation

Teaching and learning methods:
Team and group work
Peer tutoring and teaching
Pair programming
Cross-curricular learning
Project-based learning

Neurodidactical base:
"A joy (= knowledge) shared is a joy (= knowledge) doubled."
Recall = re-storage in memory
Integrating individual needs, talents, competences,
Practical relevance

4. Activity

Teaching and learning methods:
Hands-on, mind-on
Learning by doing
Learning by animation, simulation by playing and designing games (creative learning)

Neurodidactical base:
Knowledge must be created (constructed) by the learner (= constructivism)
Learning is an active process (= progressive education, e.g. Montessori)

Definitions

COOL

- **CO**operative & **C**ross-curricular **O**pen **L**earning
- **CO**mputer Science-supported **O**pen **L**earning
- “**cool**” and interesting, motivating, game-based, useful … (Sabitzer, 2014)

IT

- **I**nstructional **T**echnology & **T**ools
- **I**nformatics **T**eaching & **T**raining
- **I**nnovative **T**eaching & **T**hinking …

Computational Thinking (CT)

- Analyzing & Solving Problems
- Pattern Recognition & Abstraction
- Generalization & Algorithmic Thinking …

COMPUTATIONAL THINKING

Step by Step

01

DECOMPOSITION

A complex problem is broken down into sub-problems. These small problems are easier to understand and tasks can thus be solved systematically.

02

PATTERN RECOGNITION

Pattern recognition means that similarities, differences or patterns are searched for within the sub-problems. Complex problems can thus be solved more efficiently.

03

ABSTRACTION

Abstraction means that unimportant details are hidden. With a focus on the essential aspects, the problem becomes more understandable and thus easier to solve.

04

ALGORITHMIC THINKING

An algorithm is a step-by-step guide to solving a problem. If you know the algorithm of a problem, you can solve it faster just by following the steps.

05

DEBUGGING

"Debugging" is the process of systematically analyzing solutions using skills such as testing, tracking, and reasoning, and fixing any errors. With this accurate analysis, one can predict and verify the results..

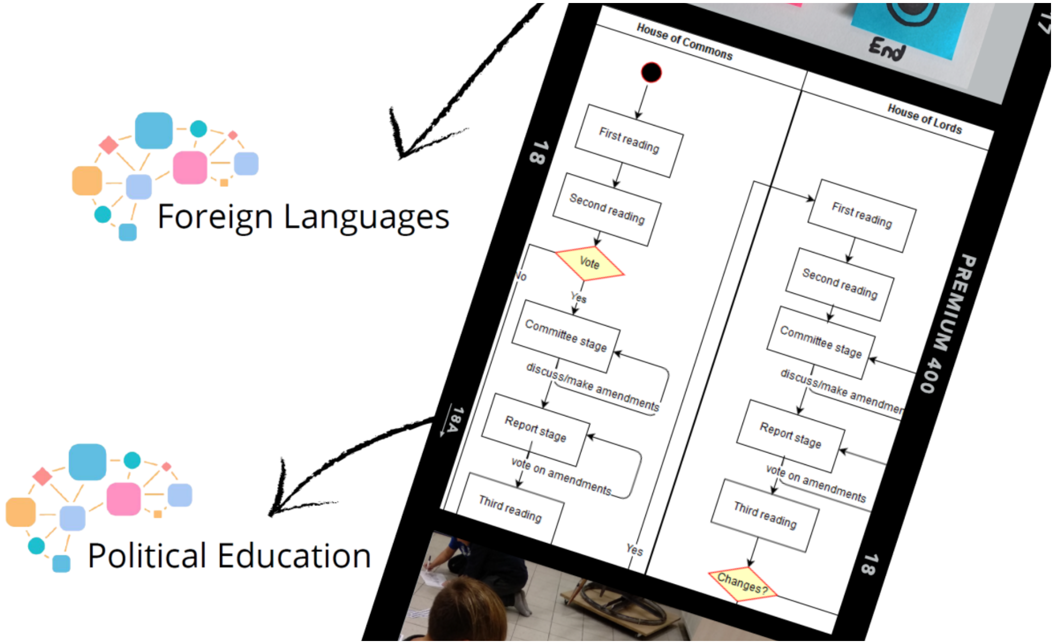
06

AUTOMATION

Automation is a labor-saving process in which a computer is instructed to perform a series of repetitive tasks quickly and efficiently compared to the processing power of a human.

2in1: A different View on Teaching & Learning

- Interdisciplinary **2in1 approach** to Computer Science Education
- **Interweaving** CS with any other subject
- Aiming at „**killing 2 birds** with **1 stroke**“
- To acquire **competencies of 2 subjects** at the same time
- Following **individual**, **personal** & **diverse** pathways

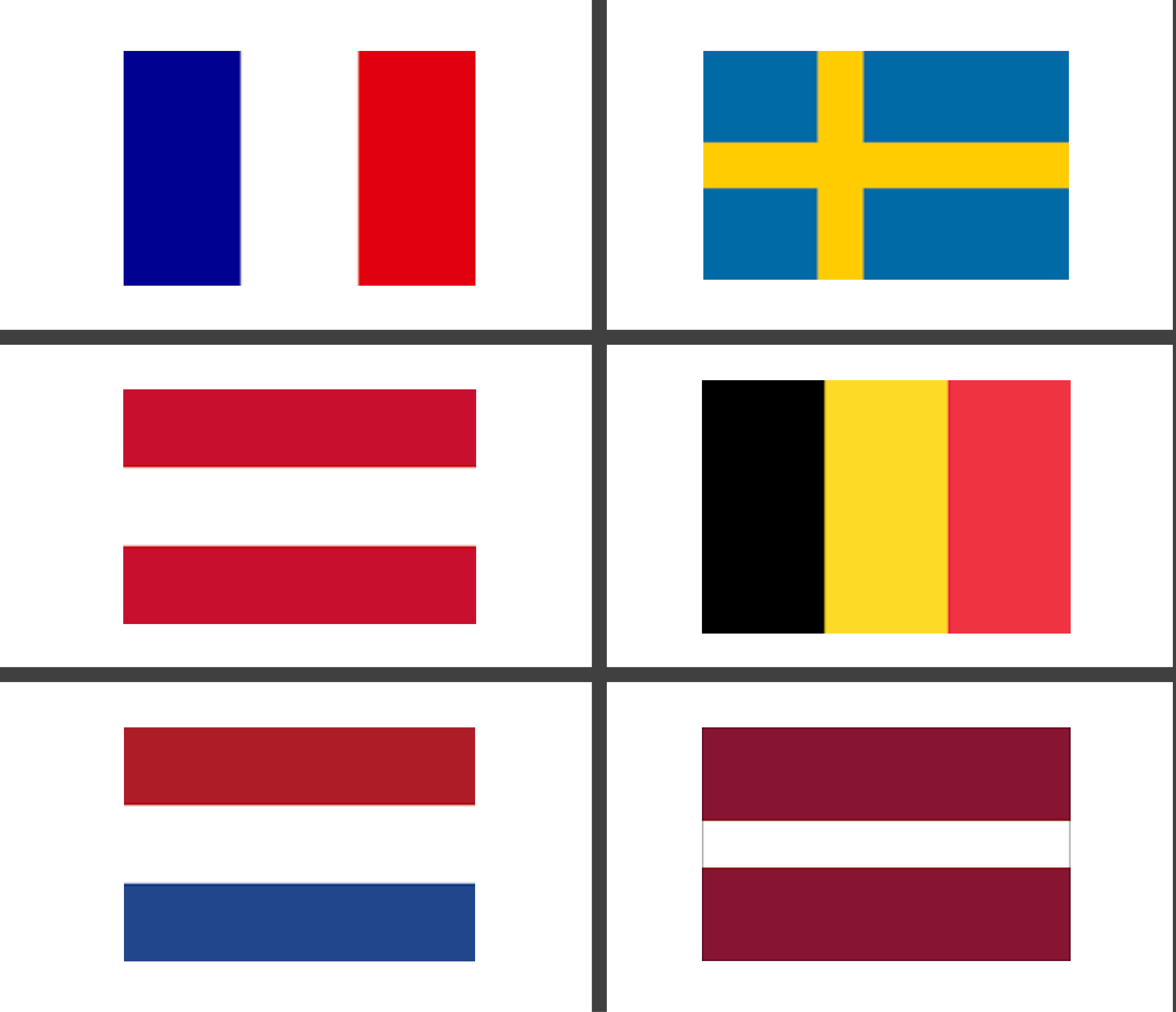


Course Organization

- Individual Roles according to competencies & talents
  - Professionals = Peer tutors, peer teachers
  - Amateurs = sometimes peer tutors
  - Beginners
- Individual Lesson structure in each unit (90 – 120 min.)
  1. Question phase (ca. 10 min) in groups with 1 peer tutor
     consider previous knowledge, recall = re-storage
  2. Discovery phase (10-20 min) in groups with 1 peer tutor
     Pattern recognition, learning rhythm (memory consolidation)
  3. Laboratory (Pair-Programming)
     Practice makes perfect, recall = re-storage
  - (lecture max. 20 minutes only if and where necessary, not necessarily by the teacher)
  - 1 & 2 sometimes are swapped or are mixed up

Individual Tasks & Methods

- Reading exercises for discovery learning
    - Reading corner (complete sample solution, correct program code, and guiding questions),
    - Puzzles (text, program code, audio)
    - Step-by-step tutorials and exercises
    - Short tasks including a sample solution
- Competence-oriented tasks for cooperative learning
    - Mini exercises for concrete competencies
    - Sample Solutions
    - Peer tutoring
- Tasks for independent practice / Project- & Problem-based Tasks
    - Short complete programs, topics of everyday life
    - Parts of a complex semester topic / project / problem



Barbara Sabitzer & Eva Schmidthaler

What does **Individuality** and **Cooperation** mean in your own countries? What methodologies do you use in your teaching/school?

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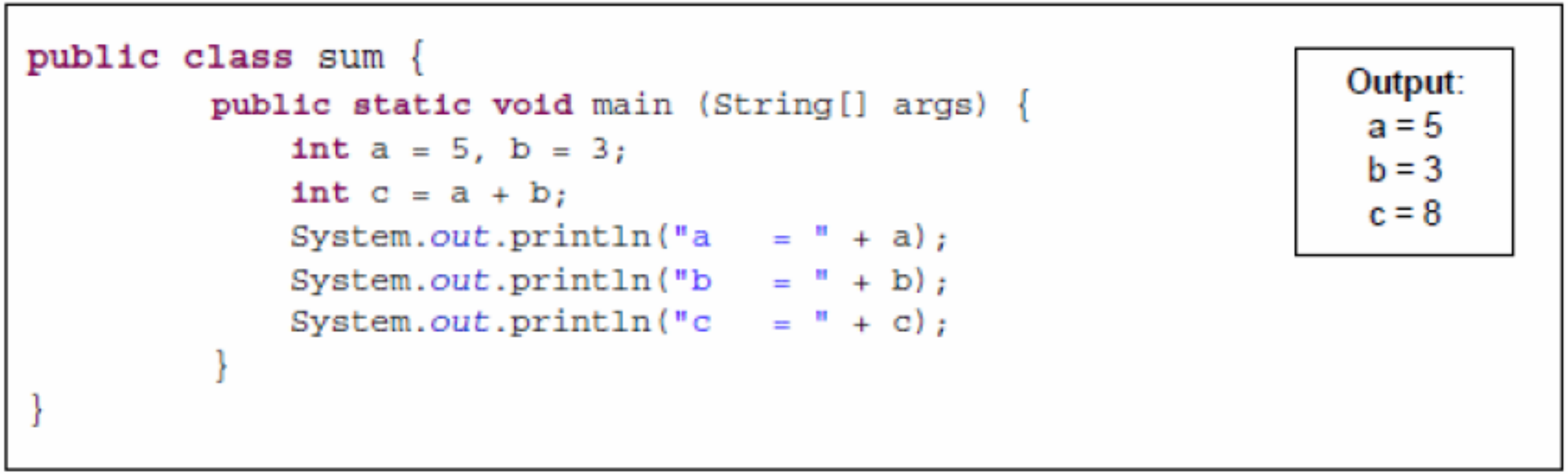
DICA - The 4 Principles in Detail

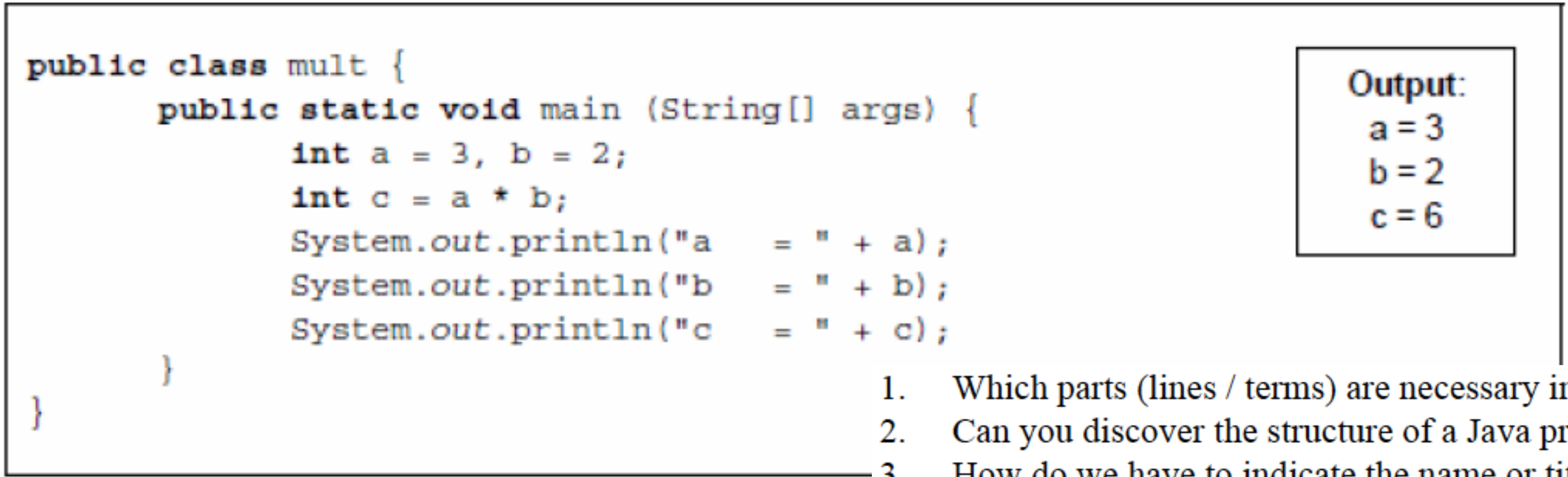
Discovery Learning – Pattern Recognition

- Tutorials
- Demonstrations
- (interactive) Videos about 5-7 min.
- Step-by-Step Tasks & Solutions
- Worked Examples
- Best Practice & Sample Solutions
- Tasks + Solution side by side
- Accompanying questions & hints – what shall be discovered?



```
public class sum {
        public static void main (String[] args) {
            int a = 5, b = 3;
            int c = a + b;
            System.out.println("a   = " + a);
            System.out.println("b   = " + b);
            System.out.println("c   = " + c);
        }
}
```

```
Output:
a = 5
b = 3
c = 8
```



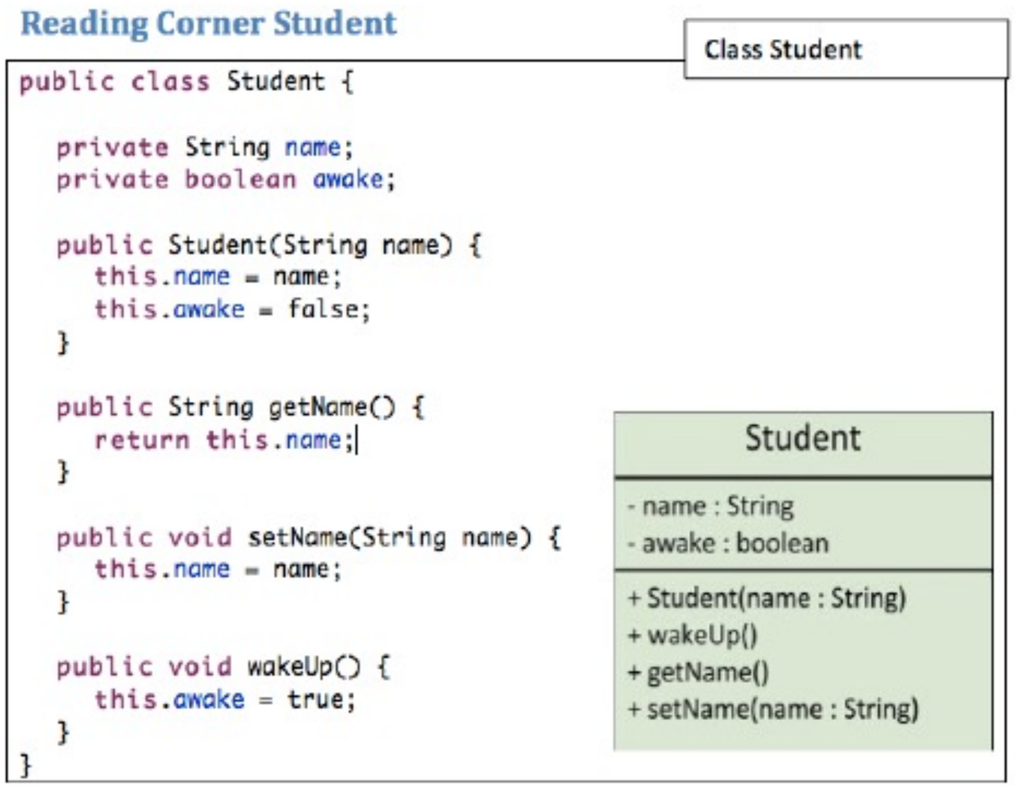
```
public class mult {
      public static void main (String[] args) {
            int a = 3, b = 2;
            int c = a * b;
            System.out.println("a   = " + a);
            System.out.println("b   = " + b);
            System.out.println("c   = " + c);
      }
}
```

```
Output:
a = 3
b = 2
c = 6
```

1. Which parts (lines / terms) are necessary in all Java-programmes?
2. Can you discover the structure of a Java programme?
3. How do we have to indicate the name or title of the programme?
4. How does a Java programme begin, how does it end?
5. What do these two programmes calculate?
6. How can we get an output?

Pattern Recognition

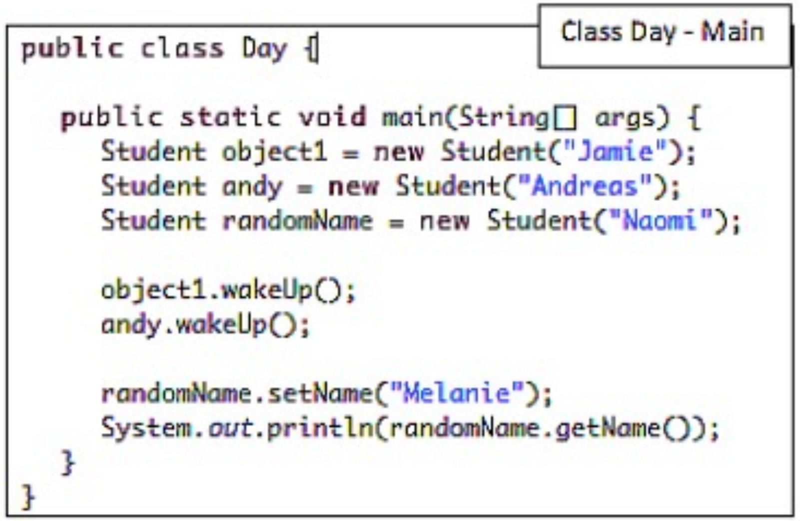
READING EXERCISES 2: READING CORNER – CLASSES AND OBJECTS



Reading Corner Student

Class Student

```
public class Student {

   private String name;
   private boolean awake;

   public Student(String name) {
      this.name = name;
      this.awake = false;
   }

   public String getName() {
      return this.name;
   }

   public void setName(String name) {
      this.name = name;
   }

   public void wakeUp() {
      this.awake = true;
   }
}
```



Class Day - Main

```
public class Day {

   public static void main(String[] args) {
      Student object1 = new Student("Jamie");
      Student andy = new Student("Andreas");
      Student randomName = new Student("Naomi");

      object1.wakeUp();
      andy.wakeUp();

      randomName.setName("Melanie");
      System.out.println(randomName.getName());
   }
}
```

Fig. 3. Reading corner “Student’s day”

EXAMPLE TASKS FOR THE READING CORNER

1. Read the example classes and write a ”cheat sheet” including the main information about classes and objects.
2. Mark the constructor in the class *Student* and its parameters. Which variables does it set? Which methods has the class *Student*? What are they doing?
3. How many objects are generated in the *main*-method (class *Day*)? What are their names?
4. How do the objects change? What will the console display?

1. Step-by-Step: Eindimensionale Arrays

Das Programm soll überprüfen, ob in einem Supermarkt ein spezielles Lebensmittel noch lagernd ist. Dazu benötigt man zuerst ein Objekt der Klasse Scanner, um das Lebensmittel einlesen zu können:

```
public class Arrays {
  static Scanner sc = new Scanner(System.in);
```

Als nächstes wird in der `main` – Methode ein `String[] supermarkt` erstellt und mit einigen Lebensmitteln (Strings) befüllt. Außerdem erstellt man eine String Variable, in der man das eingelesene Lebensmittel speichert:

```
  public static void main(String[] args) {
      String[] supermarkt = new String[] {"Brot", "Nudeln", "Milch", "Kaffee", "Zucker"};
      String lm = "";
```

Nun soll das Lebensmittel eingegeben werden:

```
      System.out.println("Bitte Lebensmittel eingeben: ");
      lm = sc.next();
```

Nun erstellt man eine Variable für die `for`-Schleife, damit man später noch darauf zugreifen kann:

```
      int i;
```

Discovery Learning with Music

Find the Italian words for:

- Table
- Wood
- Tree
- Seed
- Fruit
- Flower

What else can you understand?

Describe what can you see in the video.

Individuality & Diversity

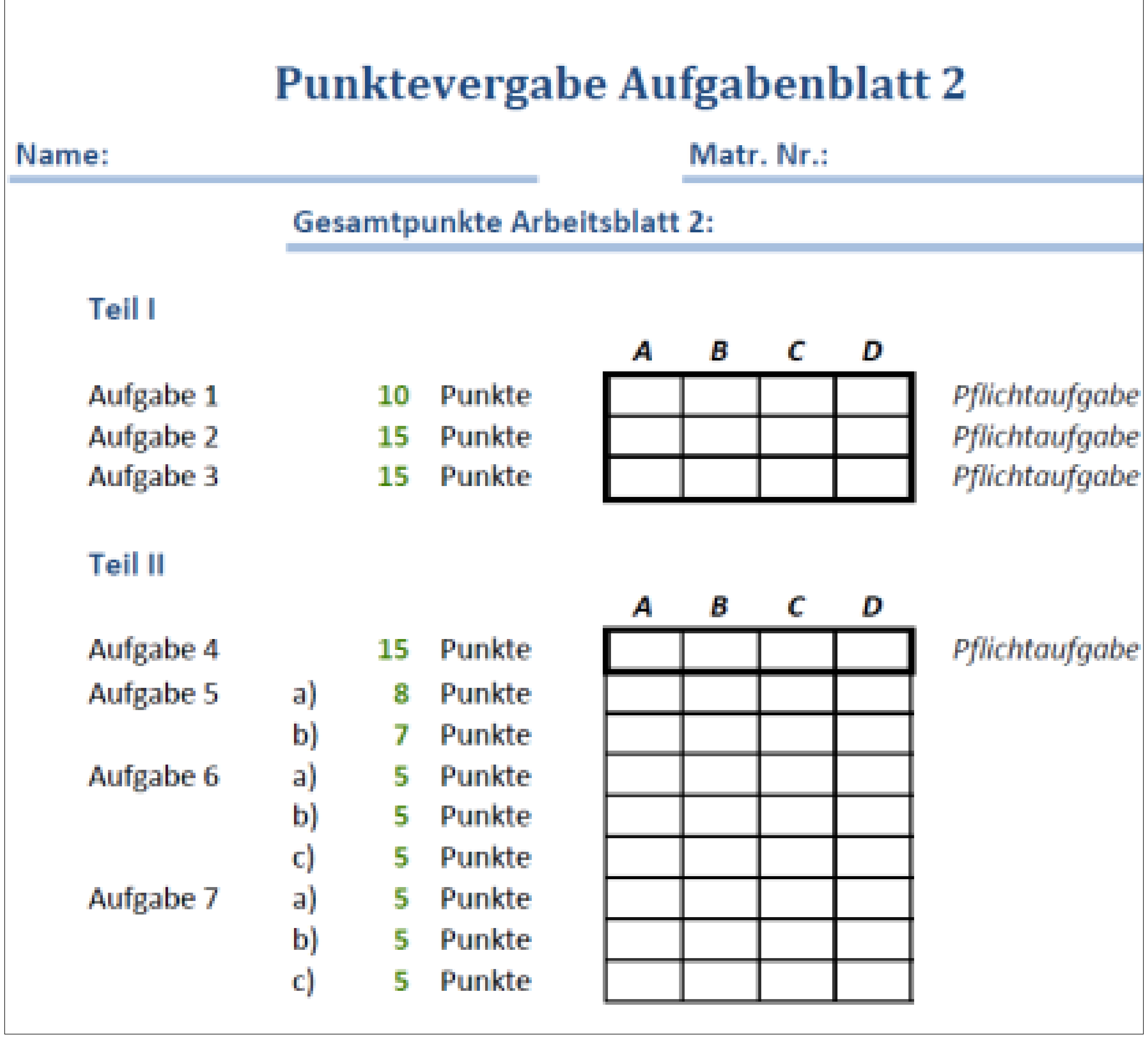
- Bringing in and considering individual
  - Preconditions & needs (diversity)
  - Interests & Learning Contents (freedom of choice)
  - Everyday life topics & aims
  - Talents – Peer Teaching & Tutoring
  - Roles – Learners, teachers, developers
  - Learning methods, preferences, rhythm ...
  - Tasks & Problems – Involving learners in task design
  - Feedback & Assessment
- Freedom of Choice!

Individualization with AI

- Personalized Learning
  - Adaptive Learning Paths
  - Scaffolding
- Individual
  - Roles
  - Learning Contents
  - (Interactive) Tasks
  - Feedback
  - Assessment

A diverse classroom where students of various ethnicities and genders are using tablet devices. Each tablet displays a unique learning module tailored to the student's learning style and pace. Created by ChatGPT & DALL-E 3.

Individualized Assessment



Punktevergabe Aufgabenblatt 2

Name: **Matr. Nr.:**

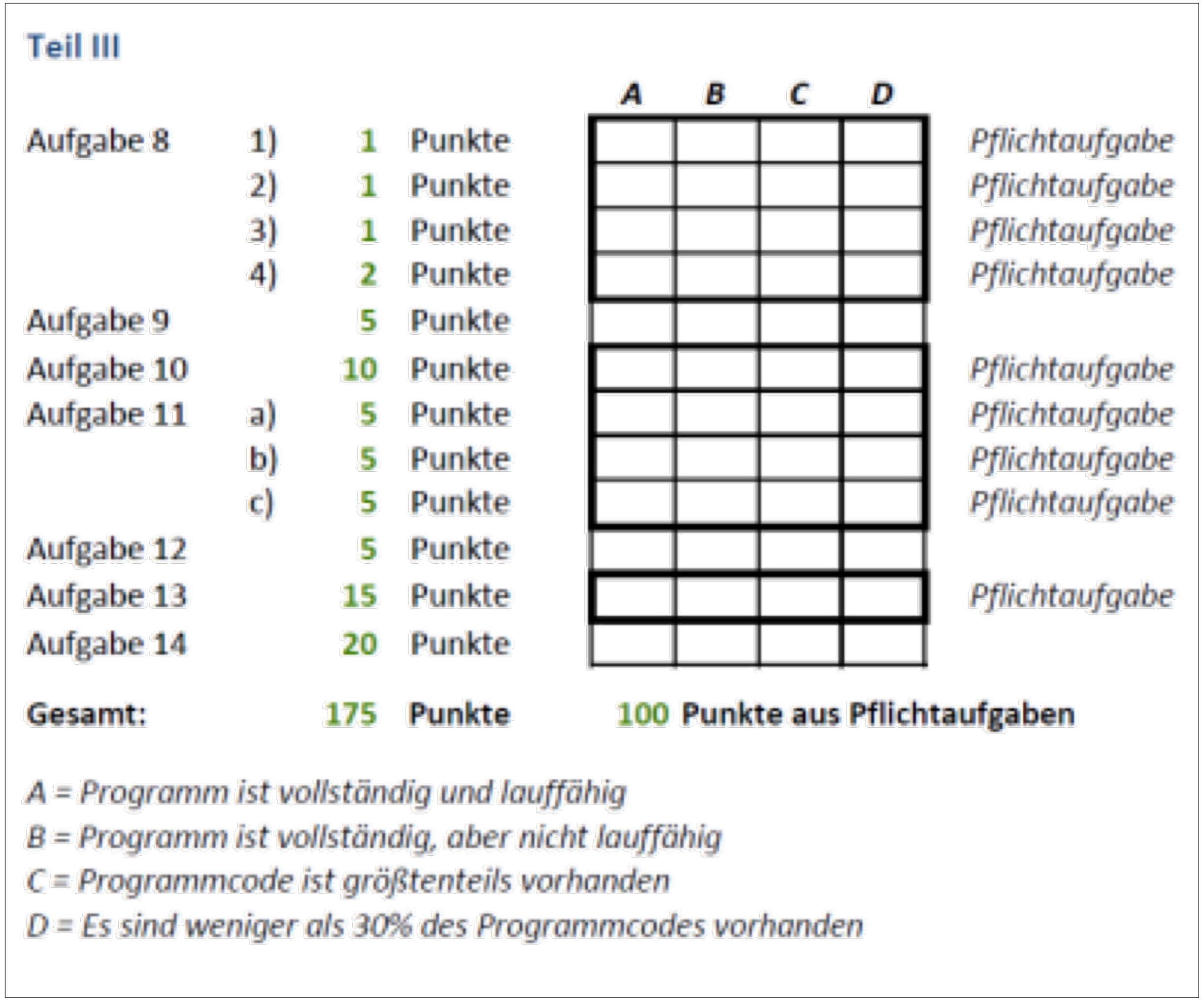
Gesamtpunkte Arbeitsblatt 2:

Teil I

				A	B	C	D	
Aufgabe 1		10	Punkte					*Pflichtaufgabe*
Aufgabe 2		15	Punkte					*Pflichtaufgabe*
Aufgabe 3		15	Punkte					*Pflichtaufgabe*

Teil II

				A	B	C	D	
Aufgabe 4		15	Punkte					*Pflichtaufgabe*
Aufgabe 5	a)	8	Punkte					
	b)	7	Punkte					
Aufgabe 6	a)	5	Punkte					
	b)	5	Punkte					
	c)	5	Punkte					
Aufgabe 7	a)	5	Punkte					
	b)	5	Punkte					
	c)	5	Punkte					

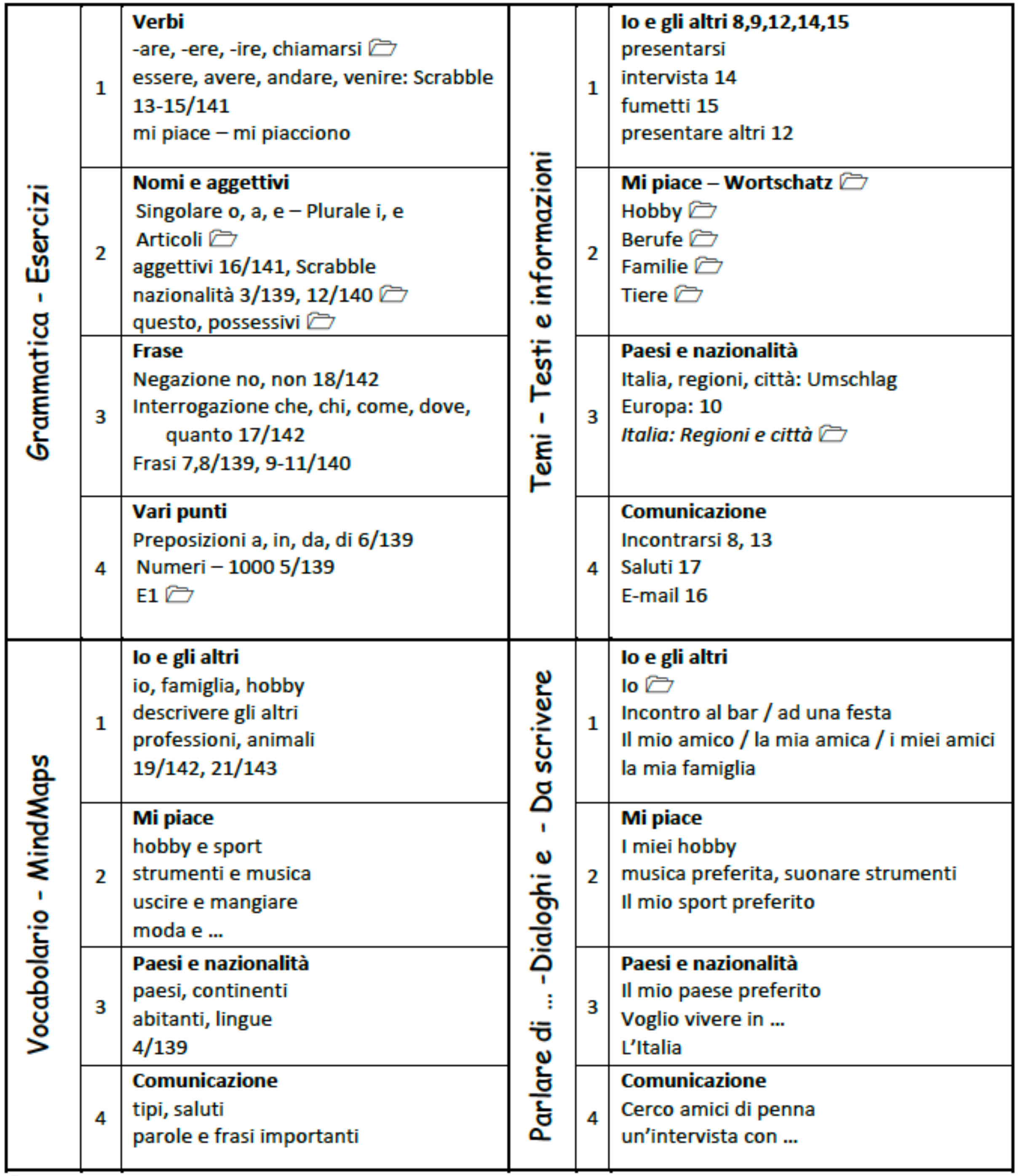


Teil III

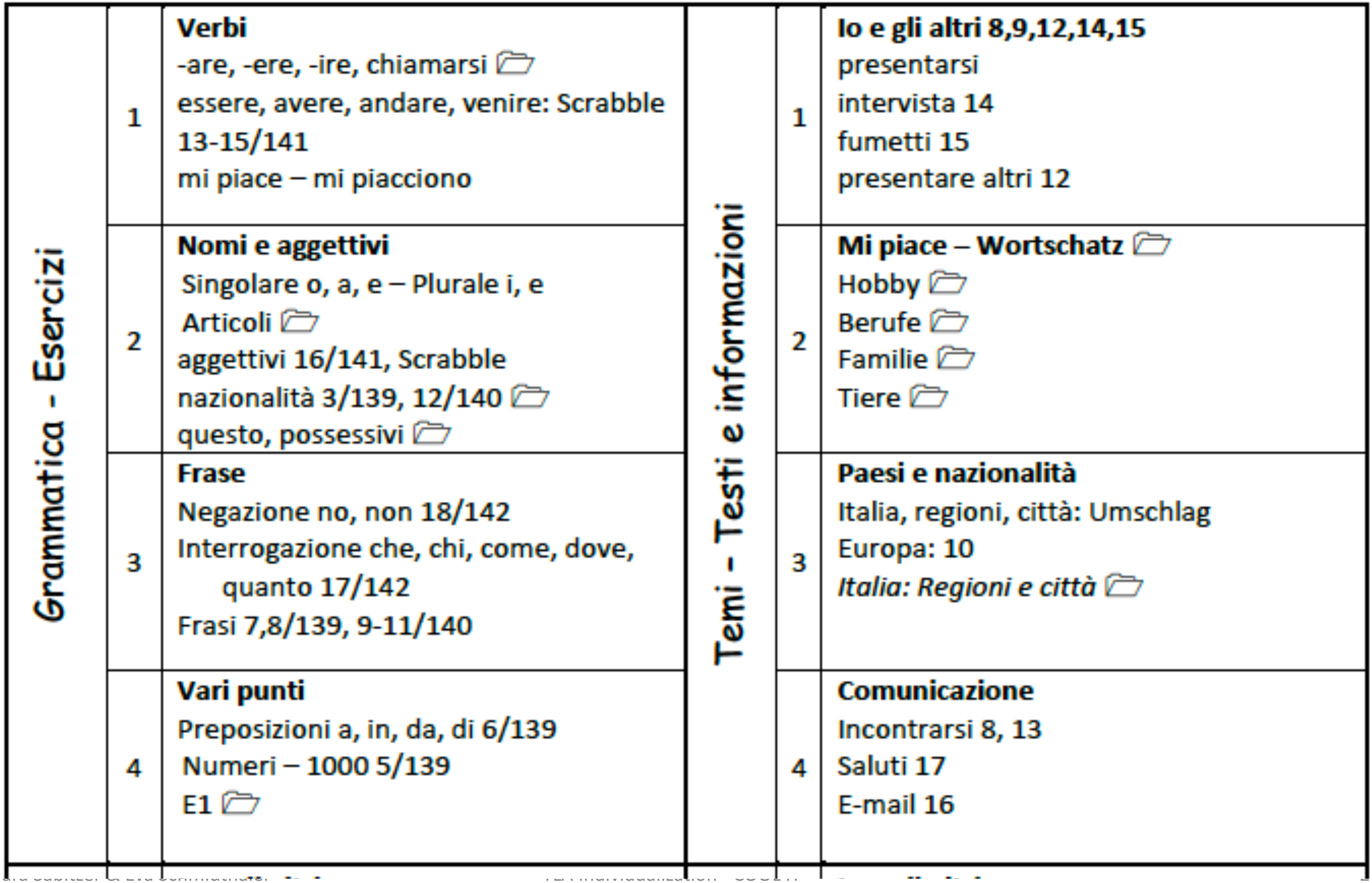
				A	B	C	D	
Aufgabe 8	1)	1	Punkte					*Pflichtaufgabe*
	2)	1	Punkte					*Pflichtaufgabe*
	3)	1	Punkte					*Pflichtaufgabe*
	4)	2	Punkte					*Pflichtaufgabe*
Aufgabe 9		5	Punkte					
Aufgabe 10		10	Punkte					*Pflichtaufgabe*
Aufgabe 11	a)	5	Punkte					*Pflichtaufgabe*
	b)	5	Punkte					*Pflichtaufgabe*
	c)	5	Punkte					*Pflichtaufgabe*
Aufgabe 12		5	Punkte					
Aufgabe 13		15	Punkte					*Pflichtaufgabe*
Aufgabe 14		20	Punkte					

Gesamt: 175 **Punkte** 100 **Punkte aus Pflichtaufgaben**

A = Programm ist vollständig und lauffähig
B = Programm ist vollständig, aber nicht lauffähig
C = Programmcode ist größtenteils vorhanden
D = Es sind weniger als 30% des Programmcodes vorhanden



Grammatica - Esercizi	1	**Verbi** -are, -ere, -ire, chiamarsi 🗁 essere, avere, andare, venire: Scrabble 13-15/141 mi piace – mi piacciono	Temi - Testi e informazioni	1	**Io e gli altri 8,9,12,14,15** presentarsi intervista 14 fumetti 15 presentare altri 12
	2	**Nomi e aggettivi** Singolare o, a, e – Plurale i, e Articoli 🗁 aggettivi 16/141, Scrabble nazionalità 3/139, 12/140 🗁 questo, possessivi 🗁		2	**Mi piace – Wortschatz** 🗁 Hobby 🗁 Berufe 🗁 Familie 🗁 Tiere 🗁
	3	**Frase** Negazione no, non 18/142 Interrogazione che, chi, come, dove, quanto 17/142 Frasi 7,8/139, 9-11/140		3	**Paesi e nazionalità** Italia, regioni, città: Umschlag Europa: 10 *Italia: Regioni e città* 🗁
	4	**Vari punti** Preposizioni a, in, da, di 6/139 Numeri – 1000 5/139 E1 🗁		4	**Comunicazione** Incontrarsi 8, 13 Saluti 17 E-mail 16
Vocabolario - MindMaps	1	**Io e gli altri** io, famiglia, hobby descrivere gli altri professioni, animali 19/142, 21/143	Parlare di … -Dialoghi e - Da scrivere	1	**Io e gli altri** Io 🗁 Incontro al bar / ad una festa Il mio amico / la mia amica / i miei amici la mia famiglia
	2	**Mi piace** hobby e sport strumenti e musica uscire e mangiare moda e …		2	**Mi piace** I miei hobby musica preferita, suonare strumenti Il mio sport preferito
	3	**Paesi e nazionalità** paesi, continenti abitanti, lingue 4/139		3	**Paesi e nazionalità** Il mio paese preferito Voglio vivere in … L'Italia
	4	**Comunicazione** tipi, saluti parole e frasi importanti		4	**Comunicazione** Cerco amici di penna un'intervista con …



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Vocabolario - MindMaps	1	**Io e gli altri** io, famiglia, hobby descrivere gli altri professioni, animali 19/142, 21/143	Parlare di … -Dialoghi e - Da scrivere	1	**Io e gli altri** Io 🗁 Incontro al bar / ad una festa Il mio amico / la mia amica / i miei amici la mia famiglia
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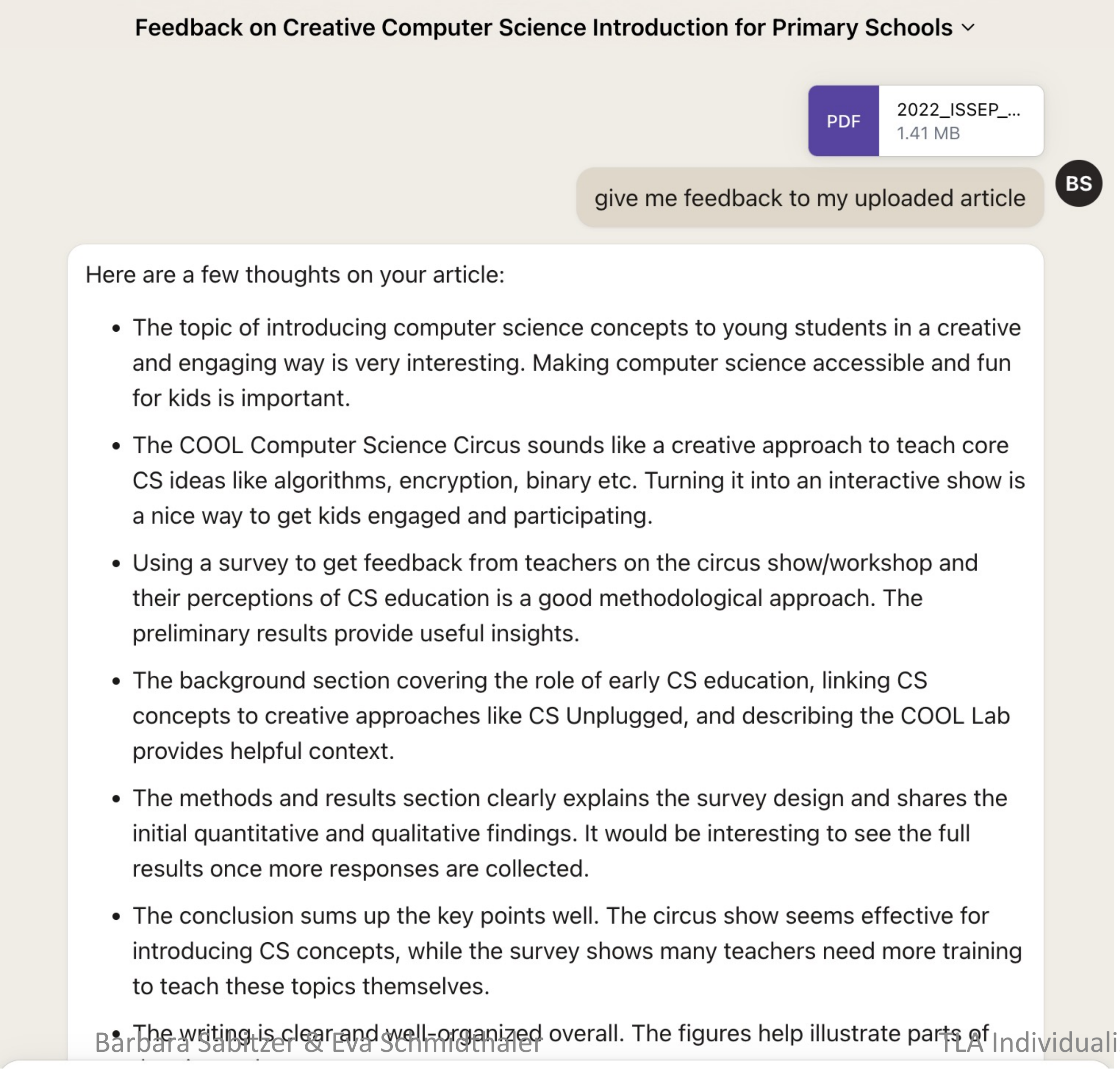
Individual Feedback by claude.ai

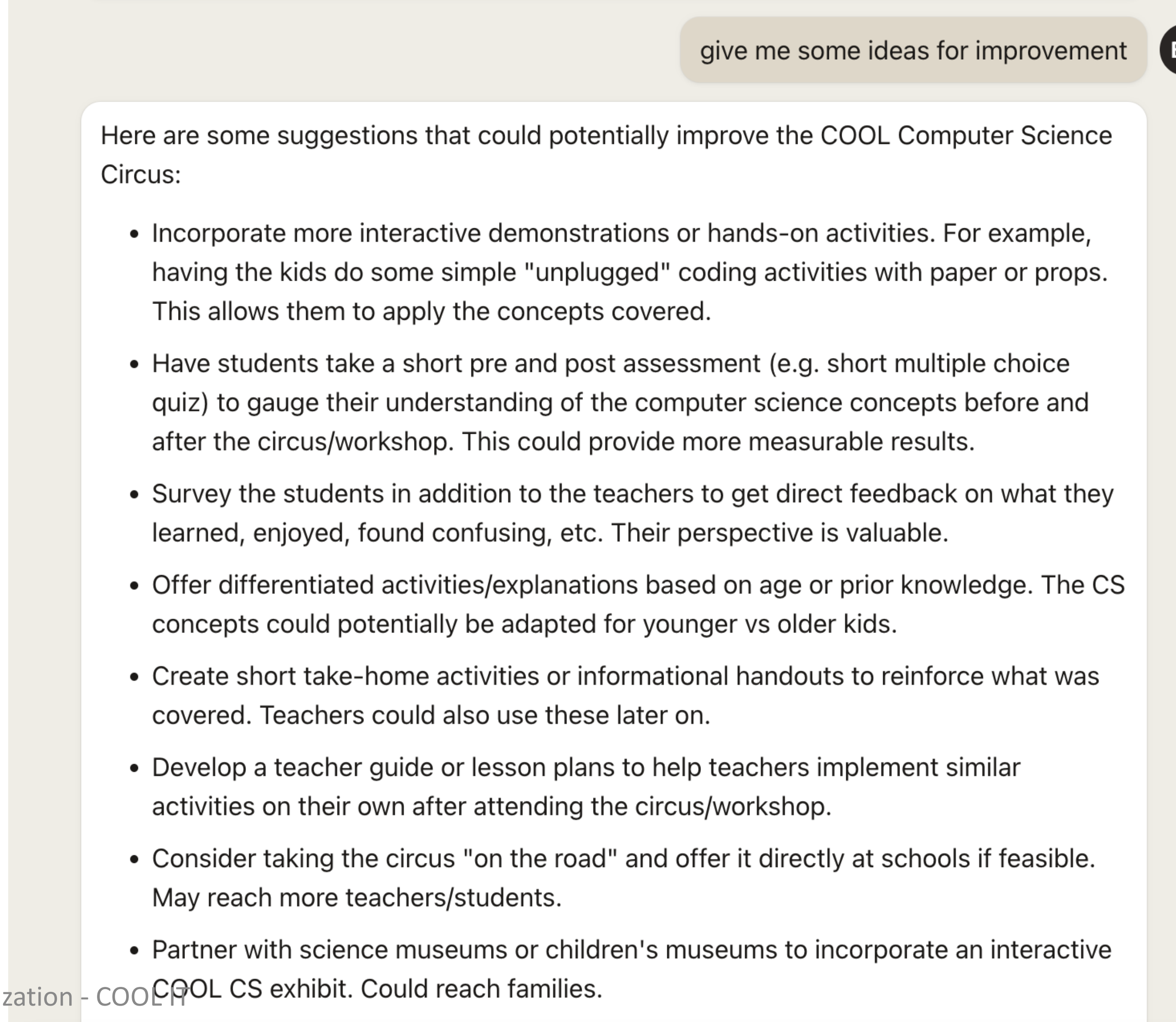


Feedback on Creative Computer Science Introduction for Primary Schools

give me feedback to my uploaded article

Here are a few thoughts on your article:

- The topic of introducing computer science concepts to young students in a creative and engaging way is very interesting. Making computer science accessible and fun for kids is important.
- The COOL Computer Science Circus sounds like a creative approach to teach core CS ideas like algorithms, encryption, binary etc. Turning it into an interactive show is a nice way to get kids engaged and participating.
- Using a survey to get feedback from teachers on the circus show/workshop and their perceptions of CS education is a good methodological approach. The preliminary results provide useful insights.
- The background section covering the role of early CS education, linking CS concepts to creative approaches like CS Unplugged, and describing the COOL Lab provides helpful context.
- The methods and results section clearly explains the survey design and shares the initial quantitative and qualitative findings. It would be interesting to see the full results once more responses are collected.
- The conclusion sums up the key points well. The circus show seems effective for introducing CS concepts, while the survey shows many teachers need more training to teach these topics themselves.
- The writing is clear and well-organized overall. The figures help illustrate parts of



give me some ideas for improvement

Here are some suggestions that could potentially improve the COOL Computer Science Circus:

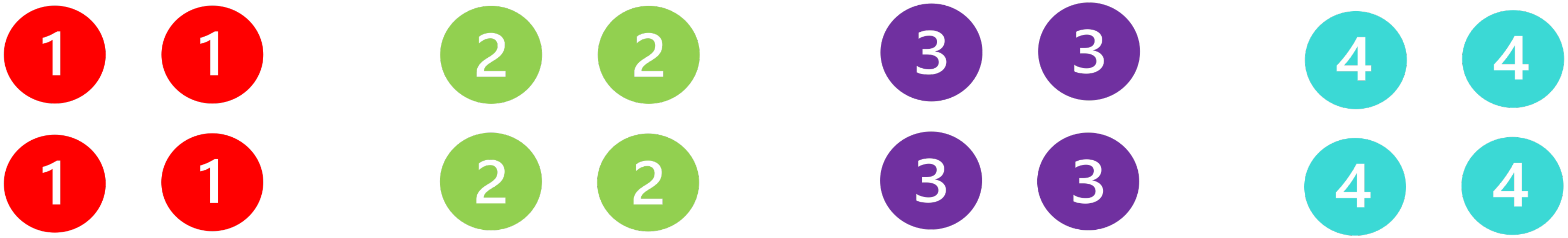
- Incorporate more interactive demonstrations or hands-on activities. For example, having the kids do some simple "unplugged" coding activities with paper or props. This allows them to apply the concepts covered.
- Have students take a short pre and post assessment (e.g. short multiple choice quiz) to gauge their understanding of the computer science concepts before and after the circus/workshop. This could provide more measurable results.
- Survey the students in addition to the teachers to get direct feedback on what they learned, enjoyed, found confusing, etc. Their perspective is valuable.
- Offer differentiated activities/explanations based on age or prior knowledge. The CS concepts could potentially be adapted for younger vs older kids.
- Create short take-home activities or informational handouts to reinforce what was covered. Teachers could also use these later on.
- Develop a teacher guide or lesson plans to help teachers implement similar activities on their own after attending the circus/workshop.
- Consider taking the circus "on the road" and offer it directly at schools if feasible. May reach more teachers/students.
- Partner with science museums or children's museums to incorporate an interactive COOL CS exhibit. Could reach families.

Cooperation

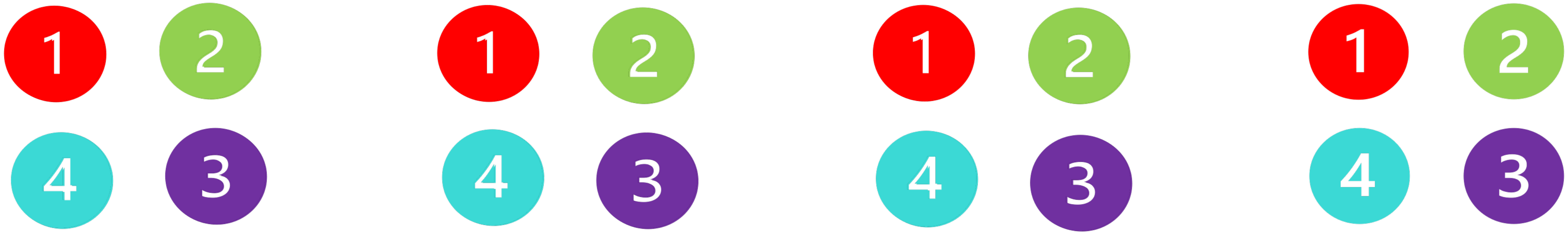
- Pair Programming
- Peer Learning
- Peer Tutoring
- Group Puzzle
- Educational Pyramid Scheme
- Talents-Exchange
- Learning by Teaching
- Buddy-Systeme
- Project-based Learning
- Problem-based Learning
- Questioning
- Interdisciplinary Learning

Group Puzzle

1. Round: Expert groups – Elaborating Knowledge



2. Round: Mixed Groups – Exchanging Knowledge



Educational Pyramid Scheme

Role	Task	Benefit
Multipliers (teachers, students, researchers) 	Mentors who are also active in the dissemination of modeling as a teaching and learning strategy. Contact persons for cooperation within the school as well as between school and university.	Training units/ ECTS credits, additional training “basic digital education”, promotion of gifted pupils, knowledge exchange, creation of materials
Mentors (teachers, students) 	Together with tutors, mentors implement modeling in the classroom. Cooperation between the mentors.	Training units/ ECTS credits, additional training “basic digital education”, promotion of gifted pupils, knowledge exchange, creation of materials
Tutors (pupils) 	Tutors together with mentors implement modeling in class. Support other students.	Extra points for paticipation, promotion of gifted pupils, “digital basic education” certificate

Activity

- „cool“ activities
- Elaborating knowledge
- Developing & Designing
- Moving & Animating
- Learning by Doing
- Creativity & Activity
- Modeling & Learning Strategies
- Playing & Game Design

Let‘s move!

Hardware & Information Processing Animation Game

We are a computer!

The Computer City

Discovery Learning, Playing

Programming Language for Dancing

Schritt vorwärts

Schritt rückwärts

Schritt rechts

Schritt links

Hände hoch

Hände runter

Springen

Klatschen

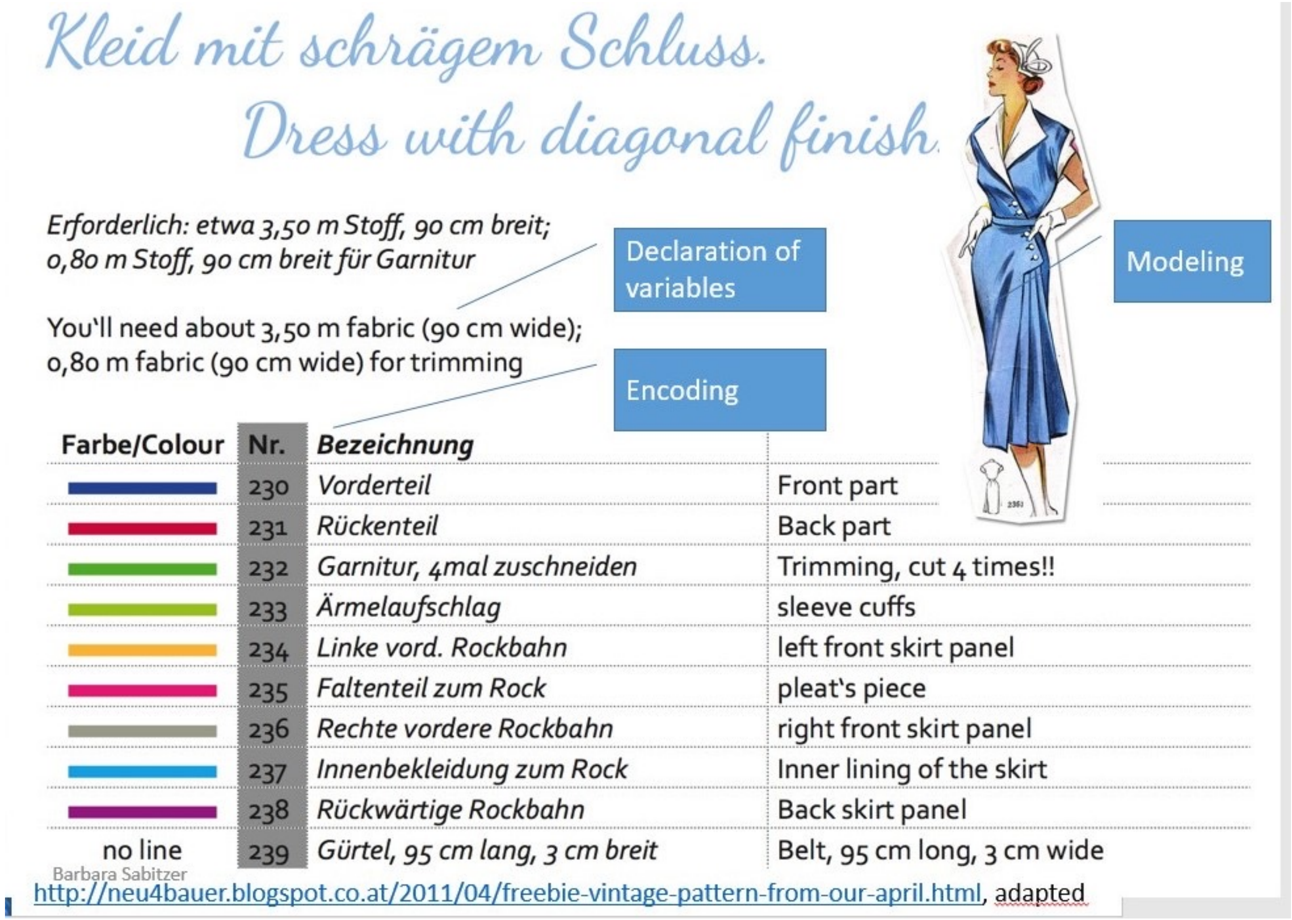
Ein Tanzprogramm könnte zum Beispiel so aussehen:

Let IT Dance

Learning by Dancing & Moving

Dancing Algorithms

2in1: Integrating Computational Thinking



Kleid mit schrägem Schluss.
Dress with diagonal finish.

Erforderlich: etwa 3,50 m Stoff, 90 cm breit;
0,80 m Stoff, 90 cm breit für Garnitur

You'll need about 3,50 m fabric (90 cm wide);
0,80 m fabric (90 cm wide) for trimming

Declaration of variables

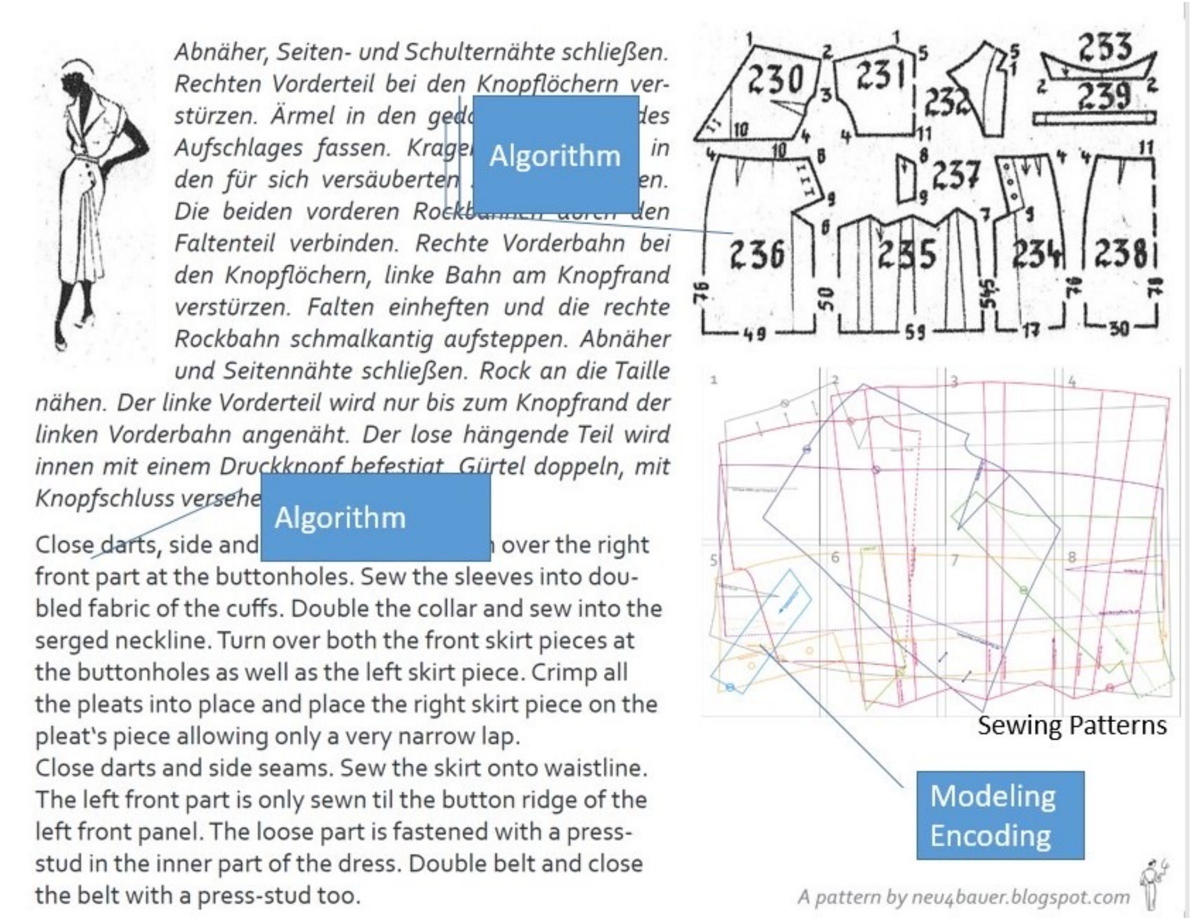
Encoding

Modeling

Farbe/Colour	Nr.	*Bezeichnung*	
🟦	230	*Vorderteil*	Front part
🟥	231	*Rückenteil*	Back part
🟩	232	*Garnitur, 4mal zuschneiden*	Trimming, cut 4 times!!
🟩	233	*Ärmelaufschlag*	sleeve cuffs
🟧	234	*Linke vord. Rockbahn*	left front skirt panel
🟥	235	*Faltenteil zum Rock*	pleat's piece
⬜	236	*Rechte vordere Rockbahn*	right front skirt panel
🟦	237	*Innenbekleidung zum Rock*	Inner lining of the skirt
🟪	238	*Rückwärtige Rockbahn*	Back skirt panel
no line	239	*Gürtel, 95 cm lang, 3 cm breit*	Belt, 95 cm long, 3 cm wide

Barbara Sabitzer

http://neu4bauer.blogspot.co.at/2011/04/freebie-vintage-pattern-from-our-april.html, adapted



Abnäher, Seiten- und Schulternähte schließen. Rechten Vorderteil bei den Knopflöchern verstürzen. Ärmel in den ged … *des Aufschlages fassen. Krage* … *in den für sich versäuberten* … *en. Die beiden vorderen Rock* … *den Faltenteil verbinden. Rechte Vorderbahn bei den Knopflöchern, linke Bahn am Knopfrand verstürzen. Falten einheften und die rechte Rockbahn schmalkantig aufsteppen. Abnäher und Seitennähte schließen. Rock an die Taille nähen. Der linke Vorderteil wird nur bis zum Knopfrand der linken Vorderbahn angenäht. Der lose hängende Teil wird innen mit einem Druckknopf befestigt. Gürtel doppeln, mit Knopfschluss versehe*

Algorithm

Close darts, side and … over the right front part at the buttonholes. Sew the sleeves into doubled fabric of the cuffs. Double the collar and sew into the serged neckline. Turn over both the front skirt pieces at the buttonholes as well as the left skirt piece. Crimp all the pleats into place and place the right skirt piece on the pleat's piece allowing only a very narrow lap.
Close darts and side seams. Sew the skirt onto waistline. The left front part is only sewn til the button ridge of the left front panel. The loose part is fastened with a press-stud in the inner part of the dress. Double belt and close the belt with a press-stud too.

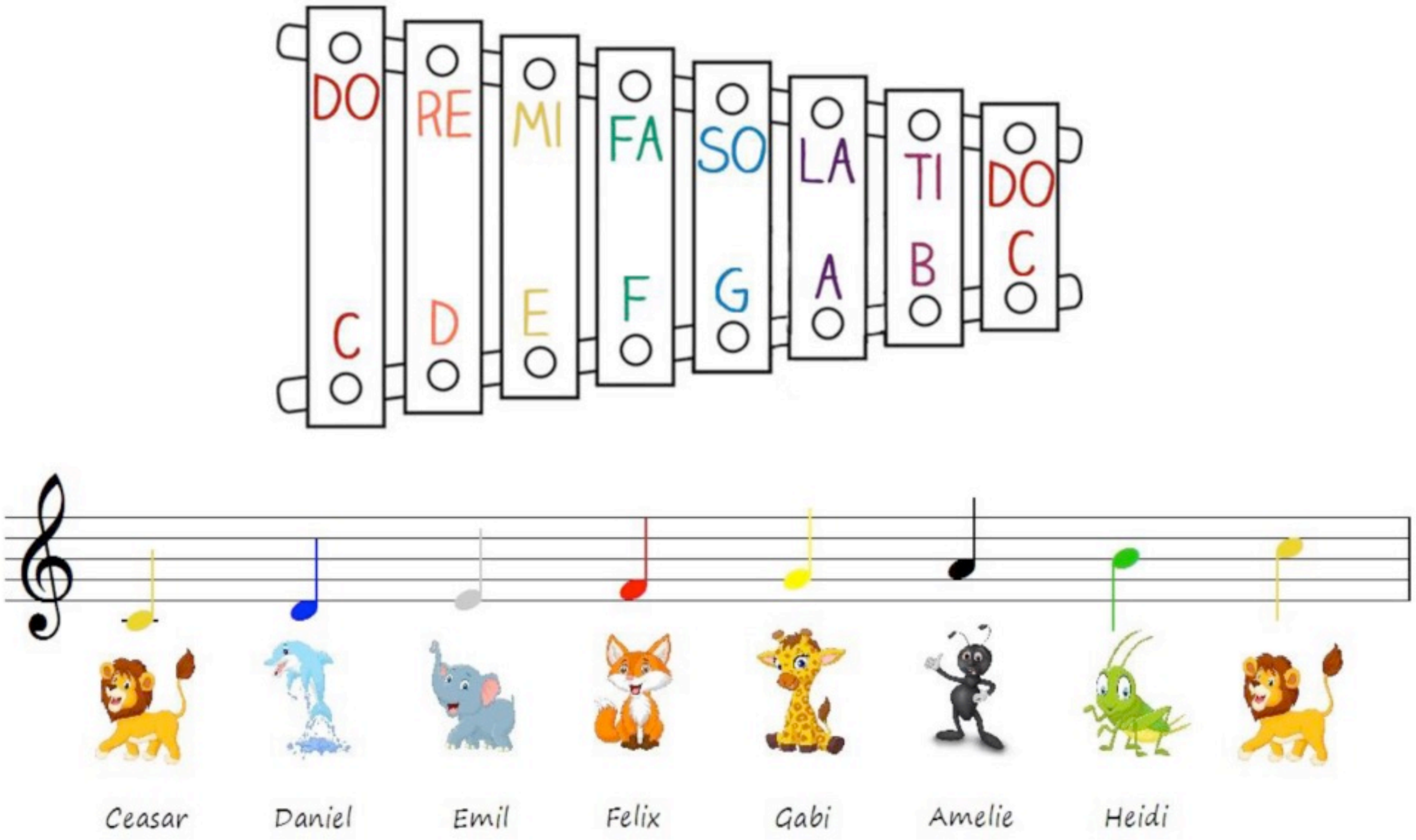
Algorithm

Sewing Patterns

Modeling
Encoding

A pattern by neu4bauer.blogspot.com

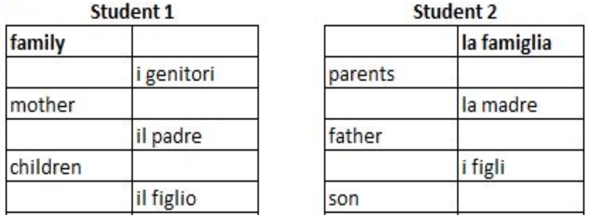
2in1: Music & Encoding



Quelle: https://www.mein-klavierunterricht-blog.de/wp-content/uploads/2015/06/bunte-Noten-%C3%9Cbersicht.jpg

2in1: Languages + Computer Science = COOL

- Tandem



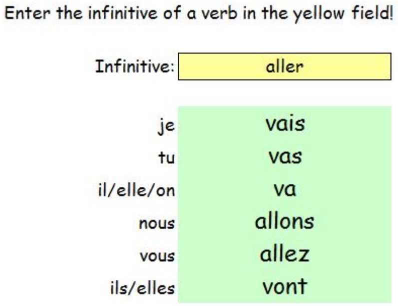
Student 1

family	
	i genitori
mother	
	il padre
children	
	il figlio

Student 2

	la famiglia
parents	
	la madre
father	
	i figli
son	

- Verb conjugator

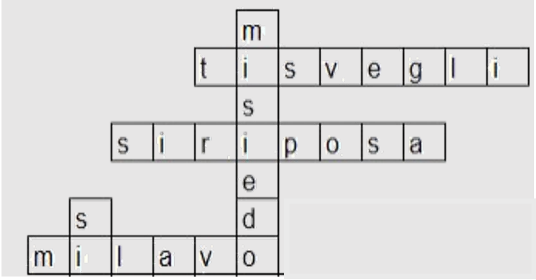


Enter the infinitive of a verb in the yellow field!

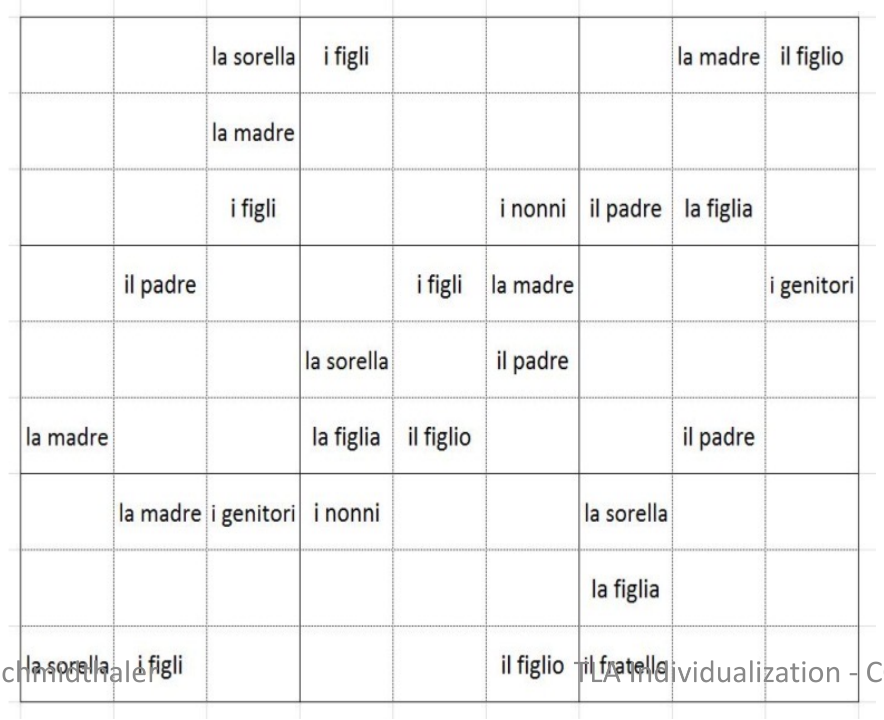
Infinitive: aller

je	vais
tu	vas
il/elle/on	va
nous	allons
vous	allez
ils/elles	vont

- Scrabble

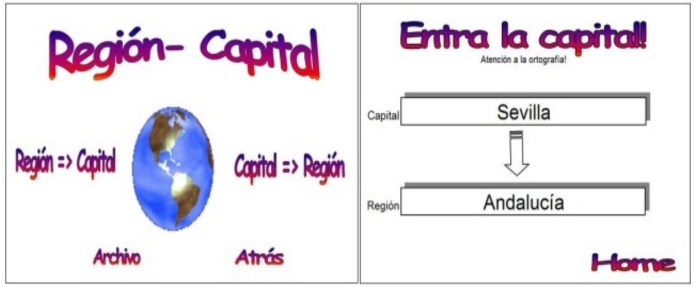


- Tandoku



		la sorella	i figli				la madre	il figlio
		la madre						
		i figli			i nonni	il padre	la figlia	
	il padre			i figli	la madre			i genitori
			la sorella		il padre			
la madre			la figlia	il figlio			il padre	
	la madre	i genitori	i nonni			la sorella		
						la figlia		
la sorella	i figli				il figlio	il fratello		

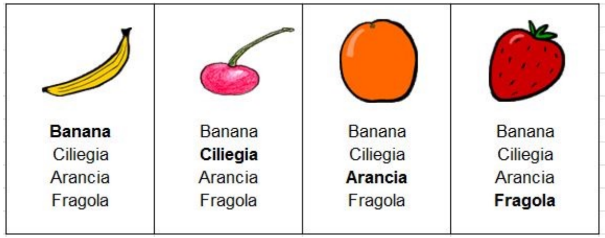
- Encyclopedia



Capital: Sevilla

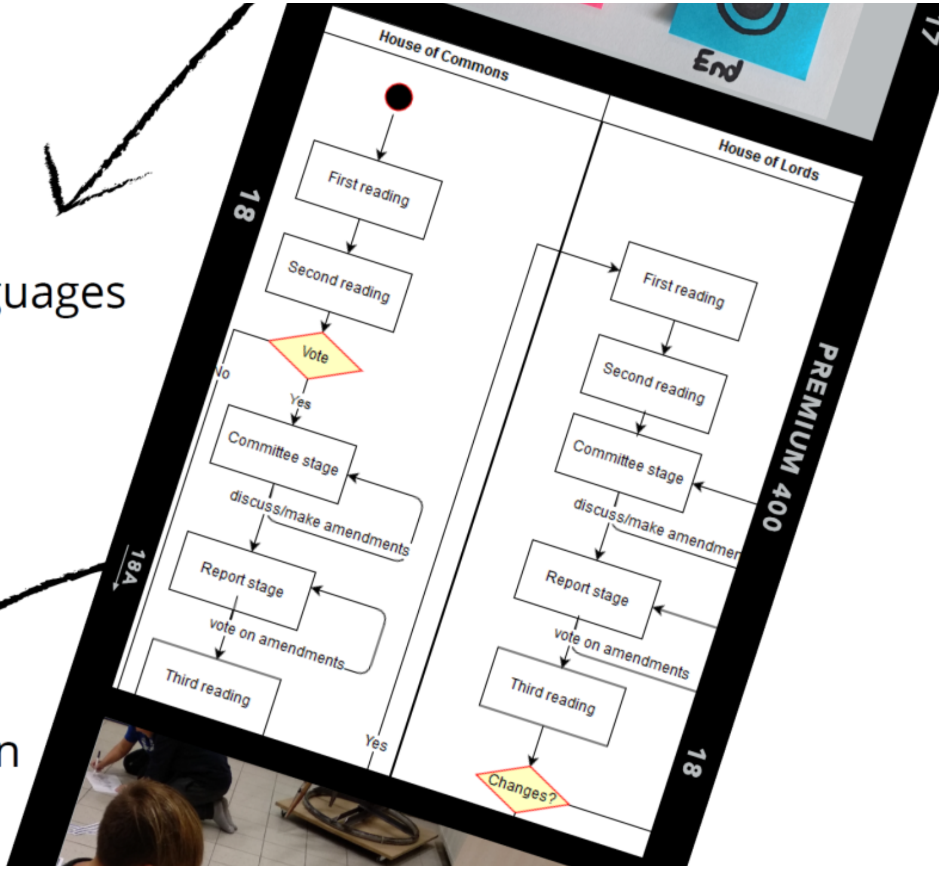
Región: Andalucía

- Quartet cards



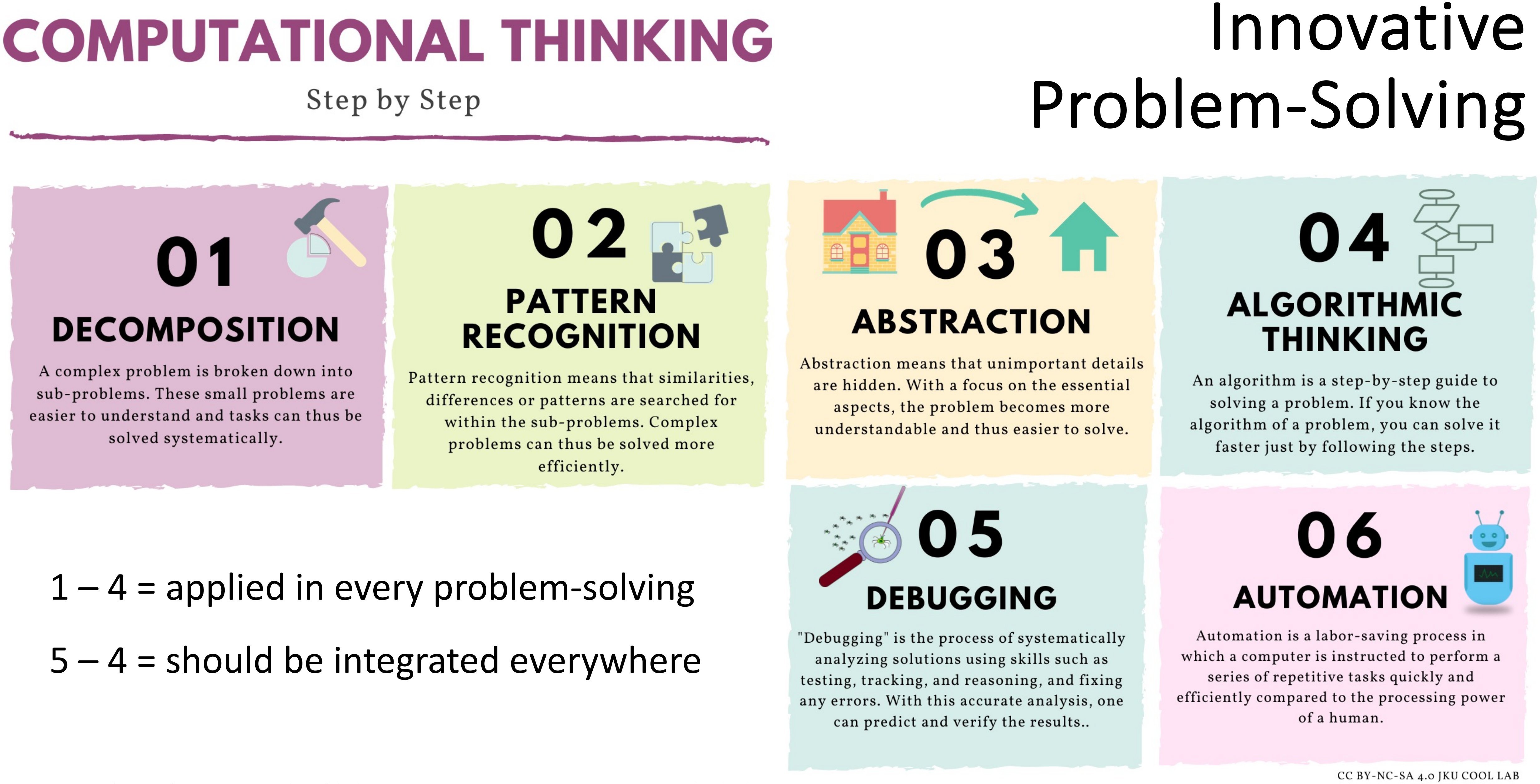
Foreign Languages

Political Education



Learning Strategies & Tools

Innovative Problem-Solving



COMPUTATIONAL THINKING

Step by Step

01

DECOMPOSITION

A complex problem is broken down into sub-problems. These small problems are easier to understand and tasks can thus be solved systematically.

02

PATTERN RECOGNITION

Pattern recognition means that similarities, differences or patterns are searched for within the sub-problems. Complex problems can thus be solved more efficiently.

03

ABSTRACTION

Abstraction means that unimportant details are hidden. With a focus on the essential aspects, the problem becomes more understandable and thus easier to solve.

04

ALGORITHMIC THINKING

An algorithm is a step-by-step guide to solving a problem. If you know the algorithm of a problem, you can solve it faster just by following the steps.

05

DEBUGGING

"Debugging" is the process of systematically analyzing solutions using skills such as testing, tracking, and reasoning, and fixing any errors. With this accurate analysis, one can predict and verify the results..

06

AUTOMATION

Automation is a labor-saving process in which a computer is instructed to perform a series of repetitive tasks quickly and efficiently compared to the processing power of a human.

1 – 4 = applied in every problem-solving

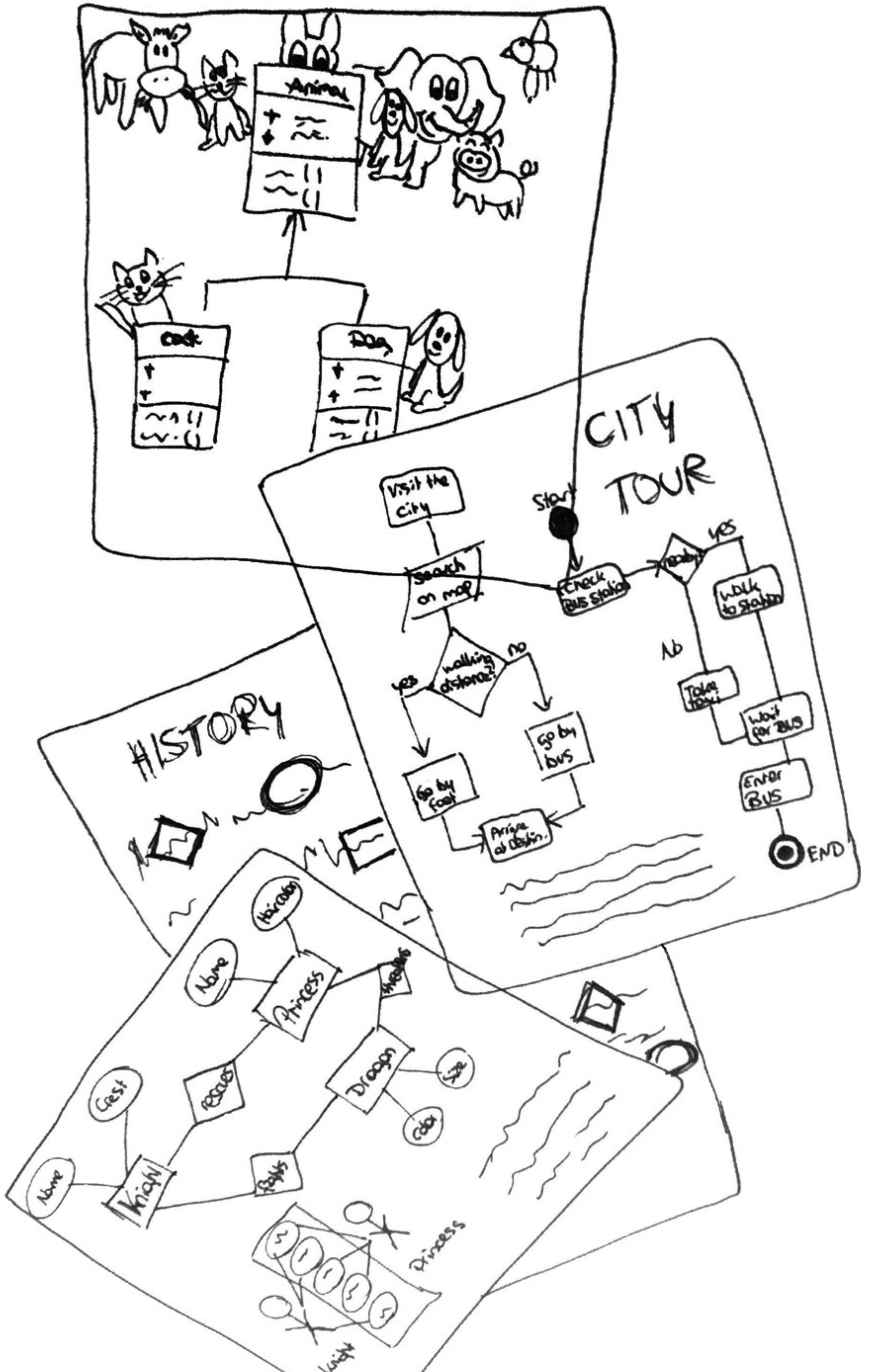
5 – 4 = should be integrated everywhere

Co-funded by the
Erasmus+ Programme
of the European Union

Modeling

Connecting Computer Science to Language Education

From Visualizing to Computer Science



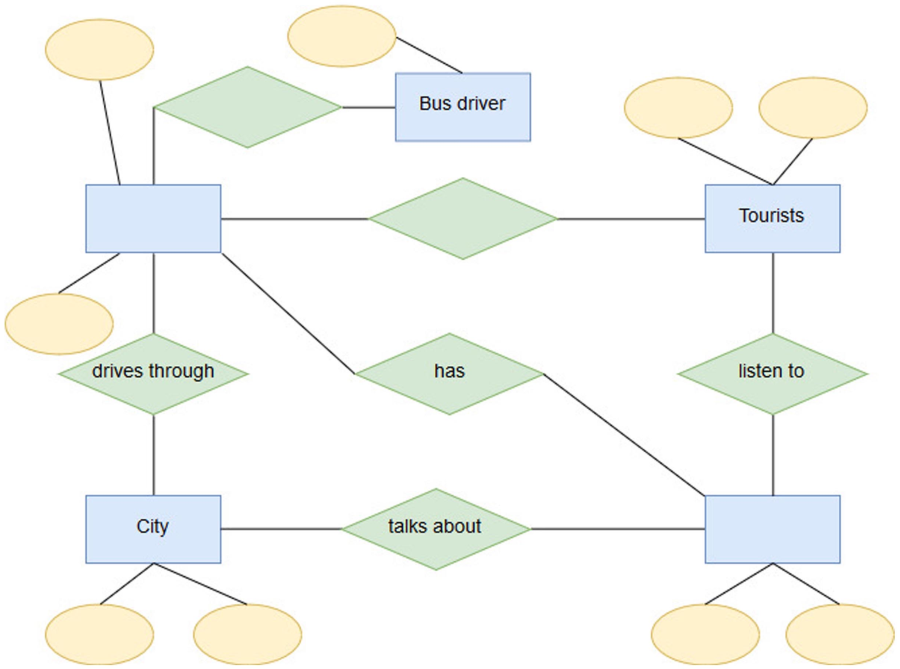
Sample Activities: The City Tour Bus

READ - DISCOVER - MATCH

The City Tour Bus

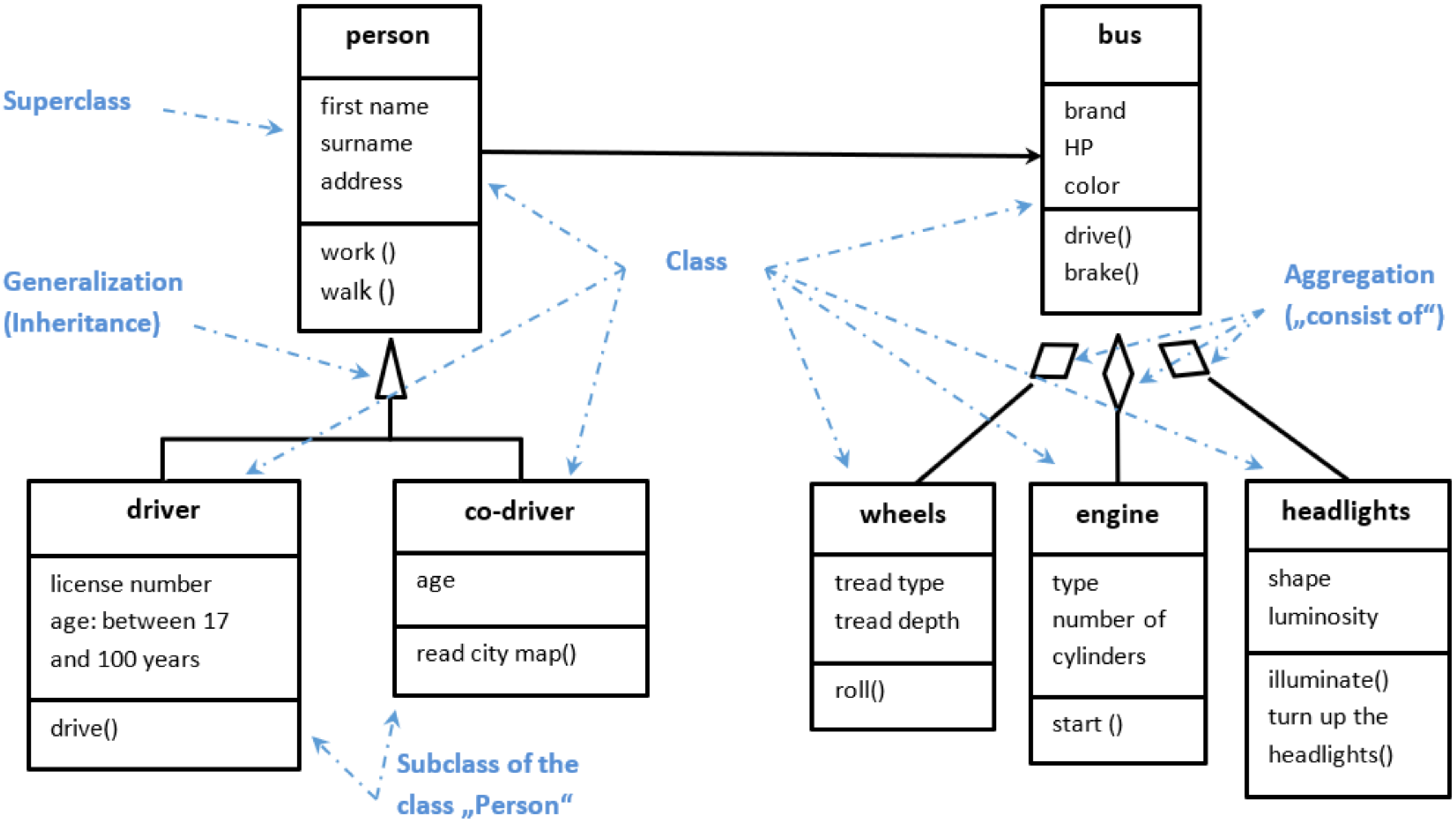
A tour bus is full of tourists. The bus drives through the city and the countryside. The bus is colourful and it has two decks. The tourists are from different countries and they are of different ages. The bus has an old bus driver and a tour guide who is from Spain and really small. The tourists can hear information about the city's and countryside's size and number of citizens out of the microphone. They enjoy learning about the city.

Some of the words fell out of their shapes. Try to put them back together.



Age (2x)	**full of**	**Origin**	**Tour bus**	**Hair colour**
Number of citizens	**Colour**	**drives**	**Tour guide**	**Size (3x)**

Sample Activities: The City Tour Bus



person

first name
surname
address

work ()
walk ()

bus

brand
HP
color

drive()
brake()

driver

license number
age: between 17 and 100 years

drive()

co-driver

age

read city map()

wheels

tread type
tread depth

roll()

engine

type
number of cylinders

start ()

headlights

shape
luminosity

illuminate()
turn up the headlights()

Superclass

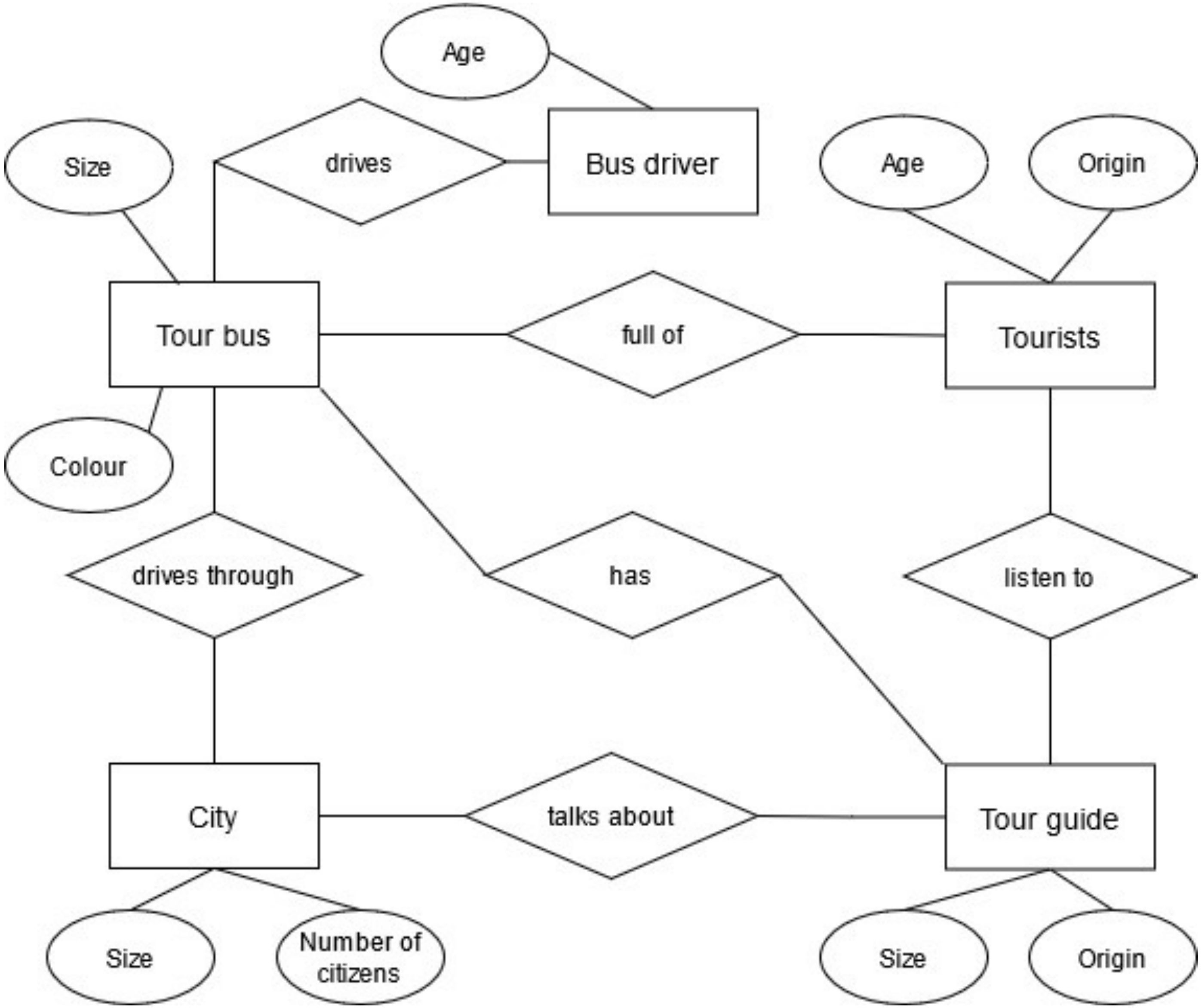
Generalization (Inheritance)

Class

Aggregation („consist of“)

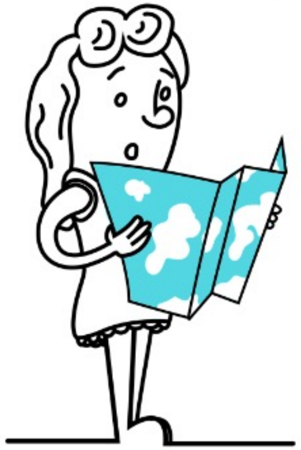
Subclass of the class „Person“

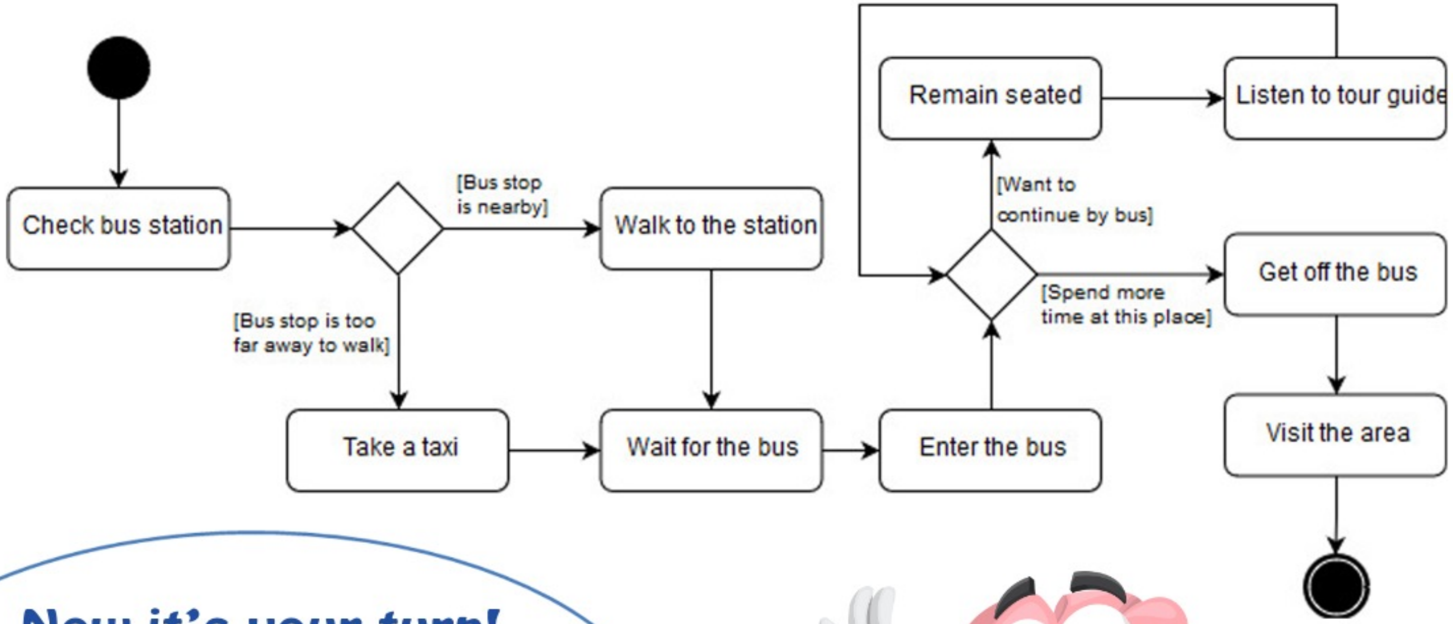
Sample Activities: The City Tour Bus



Sample Activities: The City Tour Bus

Susan, a tourist from England is very excited to go on the tour bus and wants to see and experience as much as possible. Therefore, she decided to plan her tour with an activity diagram the day before. Have a look at the diagram and try to find out the meaning behind the different shapes.





Check bus station

[Bus stop is nearby]

[Bus stop is too far away to walk]

Walk to the station

Take a taxi

Wait for the bus

Enter the bus

[Want to continue by bus]

[Spend more time at this place]

Remain seated

Listen to tour guide

Get off the bus

Visit the area

Now it's your turn!

Choose one of the topics below and create your own activity diagram.

- How to play your favourite game
- How to cook your favourite meal
- Your way to school

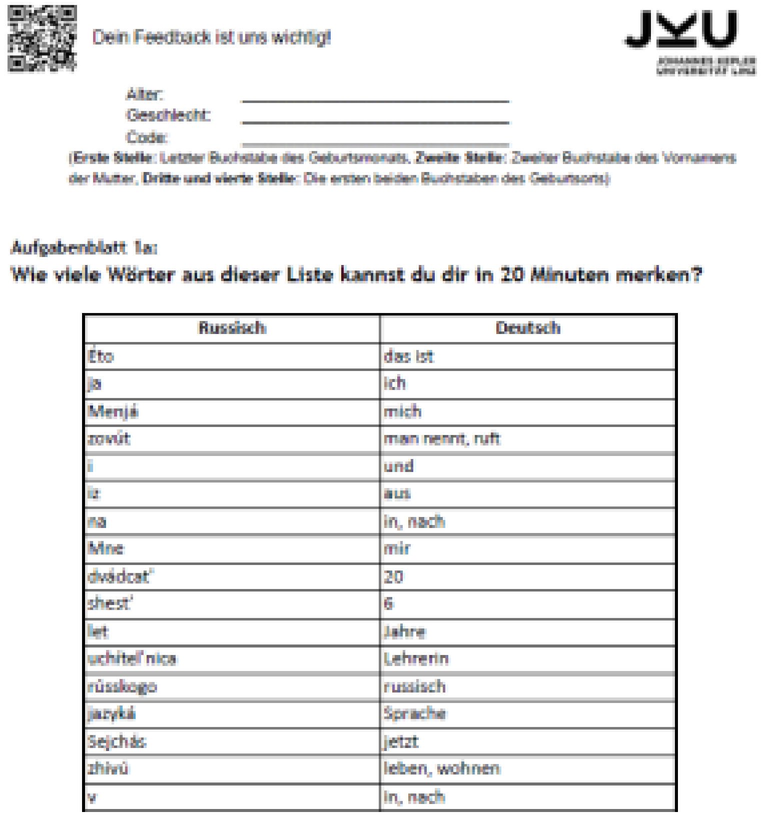
Modeling supports Vocabulary Acquisition

Dein Feedback ist uns wichtig!

Alter: ______
Geschlecht: ______
Code: ______
(**Erste Stelle:** Letzter Buchstabe des Geburtsmonats, **Zweite Stelle:** Zweiter Buchstabe des Vornamens der Mutter, **Dritte und vierte Stelle:** Die ersten beiden Buchstaben des Geburtsorts)

Aufgabenblatt 1b:
Wie viele Wörter aus diesen drei Klassendiagrammen kannst du dir in 20 Minuten merken?

	Person
ja	ich
Menjá	mich
zovút	man nennt, ruft
Mne	mir
dvádcat'	20
shest'	6
uchítel'nica	Lehrerin
rússkogo	russisch
jazyká	Sprache
uchús'	unterrichten
izucháju	studieren
publicístiku	Publizistik
	Ort und Zeit
Ávstrii	Österreich
let	Jahre
vrémja	Zeit
svobódnoe	frei
Sejchás	jetzt
v	in, nach
iz	aus
na	in, nach
	sprechen & tun
Éto	das ist
i	und
zhivú	leben, wohnen
ljubljú	lieben
puteshéstvovat'	reisen



Dein Feedback ist uns wichtig!

Alter: ______
Geschlecht: ______
Code: ______
(**Erste Stelle:** Letzter Buchstabe des Geburtsmonats, **Zweite Stelle:** Zweiter Buchstabe des Vornamens der Mutter, **Dritte und vierte Stelle:** Die ersten beiden Buchstaben des Geburtsorts)

Aufgabenblatt 1a:
Wie viele Wörter aus dieser Liste kannst du dir in 20 Minuten merken?

Russisch	**Deutsch**
Éto	das ist
ja	ich
Menjá	mich
zovút	man nennt, ruft
i	und
iz	aus
na	in, nach
Mne	mir
dvádcat'	20
shest'	6
let	Jahre
uchítel'nica	Lehrerin
rússkogo	russisch
jazyká	Sprache
Sejchás	jetzt
zhivú	leben, wohnen
v	in, nach

1 Э́то я и моя́ семья́ - Éto ja i mojá sem'já

Teil 1 -

Э́то я. Меня́ зову́т Татья́на и я из Росто́ва–на–Дону́. Мне 26 (два́дцать шесть) лет. Я учи́тельница ру́сского языка́. Сейча́с я живу́ в Крумпендо́рфе в А́встрии и учу́сь в Кла́ген–фурте. Я изуча́ю публици́стику. В свобо́дное вре́мя я люблю́ путеше́ствовать.

Éto ja. Menjá zovút Tat'jána i ja iz Rostóva–na–Donú. Mne 26 (dvádcat' shest') let. Ja uchítel'nica rússkogo jazyká. Sejchás ja zhivú v Krumpendórfe v Ávstrii i uchús' v Klágen–furte. Ja izucháju publicístiku. V svobódnoe vrémja ja ljubljú puteshéstvovat'.

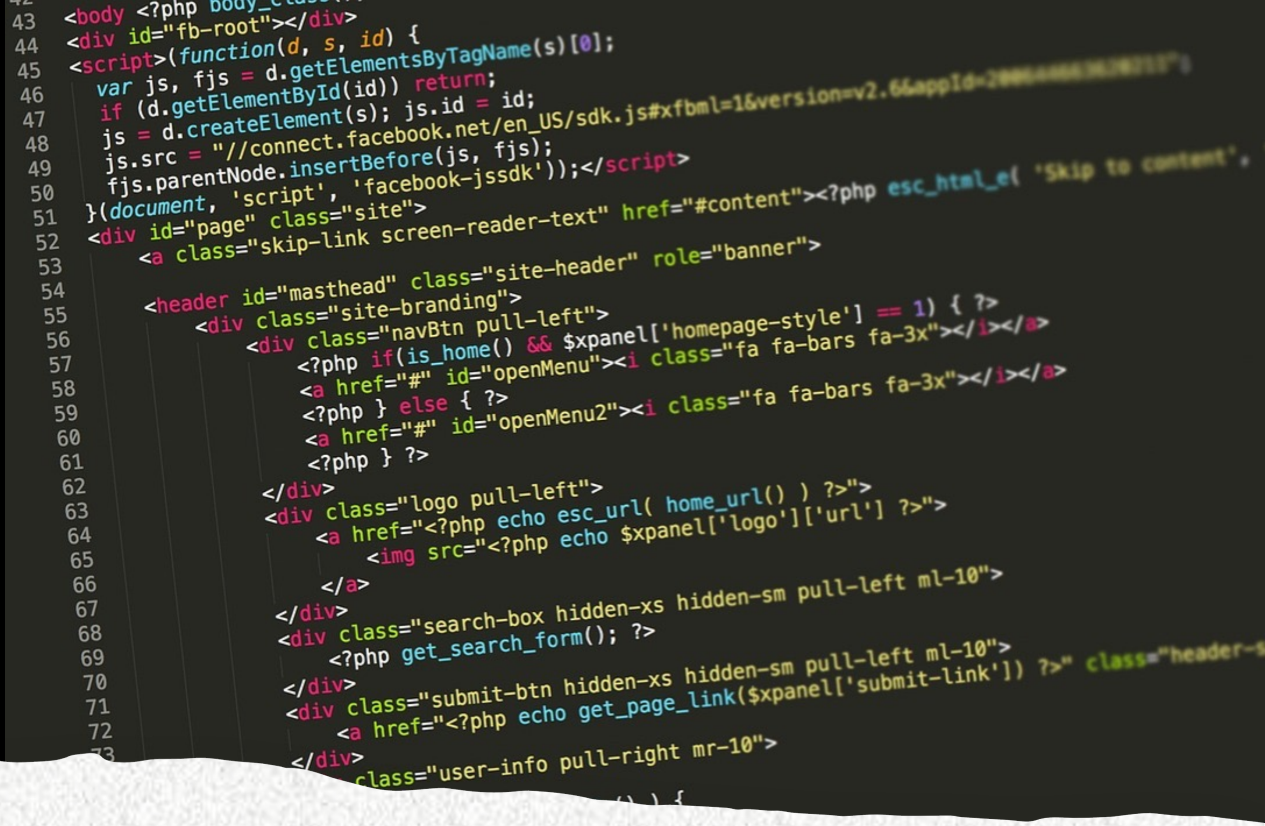
Sabitzer, B., & Koryakina, T. (2010). *Moja dorogaja Rossija: ein landeskundliches Lese- und Arbeitsbuch für Anfänger und Fortgeschrittene; Niveau A1 bis B1*. Weber.

Selected Results

(> 400 students and teachers)

“In my English class I elaborated the **grammar** topic *Reported Speech* with **activity diagrams.** The pupils were very **enthusiastic** about the presentation, as it made the **individual steps clear** to them. "

- **Acceptance** (high after convincing teachers)
  - Motivating, **creative**, useful, easy to learn but
  - Abstraction is difficult, fear of mistakes (Sabitzer & Pasterk, 2015)
- Usability for people without CS background
  - **Structuring** learning contents:
    - ER-, class-, use case- diagrams
  - **Visualizing** rules and procedures:
    - activity diagrams
- Impact on learning outcomes (work in progress)
  - **Siginificant higher recall performance** in 1st round of Russian vocabulary experiment (N=71, n_m=43, n_f=28, mean age 13.4, SD 0.97)



```
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  var js, fjs = d.getElementsByTagName(s)[0];
  if (d.getElementById(id)) return;
  js = d.createElement(s); js.id = id;
  js.src = "//connect.facebook.net/en_US/sdk.js#xfbml=1&version=v2.6&appId=
  fjs.parentNode.insertBefore(js, fjs);
}(document, 'script', 'facebook-jssdk'));</script>
<div id="page" class="site">
    <a class="skip-link screen-reader-text" href="#content"><?php esc_html_e( 'Skip to content',

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        <div class="site-branding">
            <div class="navBtn pull-left">
                <?php if(is_home() && $xpanel['homepage-style'] == 1) { ?>
                <a href="#" id="openMenu"><i class="fa fa-bars fa-3x"></i></a>
                <?php } else { ?>
                <a href="#" id="openMenu2"><i class="fa fa-bars fa-3x"></i></a>
                <?php } ?>
            </div>
            <div class="logo pull-left">
                <a href="<?php echo esc_url( home_url() ) ?>">
                    <img src="<?php echo $xpanel['logo']['url'] ?>">
                </a>
            </div>
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                <?php get_search_form(); ?>
            </div>
            <div class="submit-btn hidden-xs hidden-sm pull-left ml-10">
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```

Translanguaging

Connecting Linguistics to Computer Science

Enriching Programming Education

Translanguaging

Planned use of 2 languages to achieve 1 goal

Translanguaging

is a pedagogical practice designed by the teacher ‘**who uses the stronger language to develop the weaker one,** and in this way, it implies a deep understanding of meaning and **can result in increased proficiency in the two languages**.’ (Cenoz & Gorter, 2020).

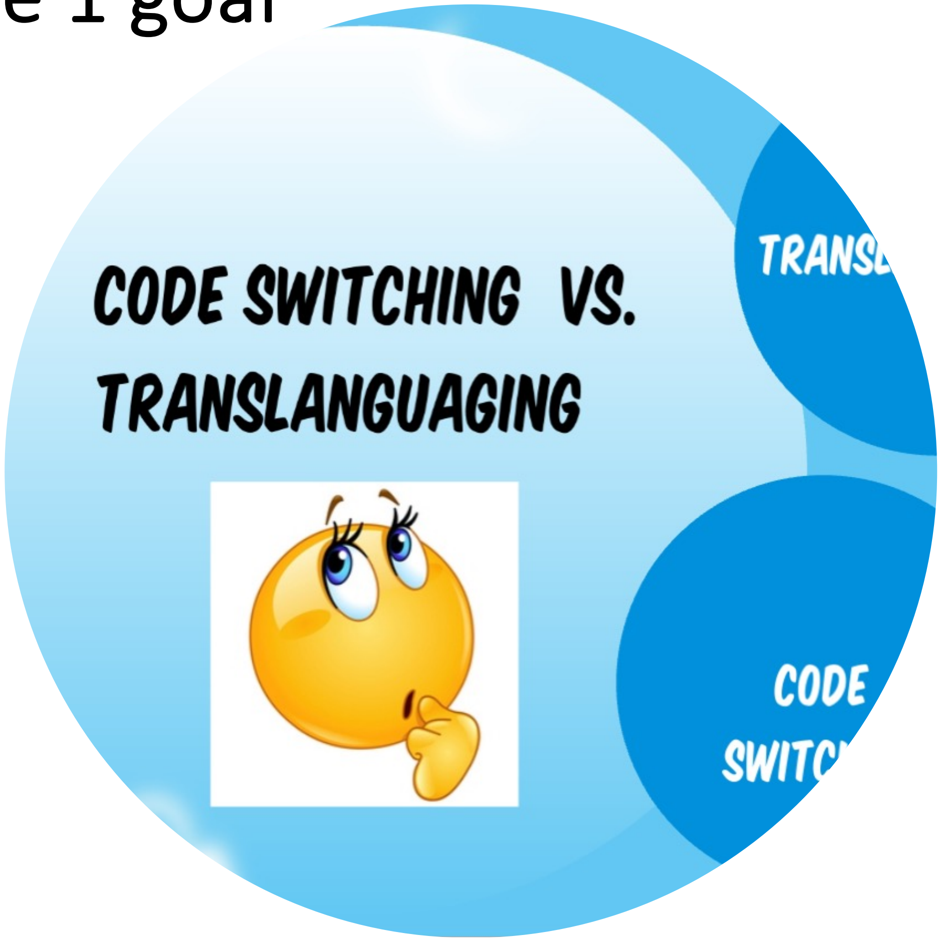
Code switching

in **natural situations**

Languages can be

Natural languages, Programming languages …

Signs, Gestures, Models, Diagrams, Lego ...



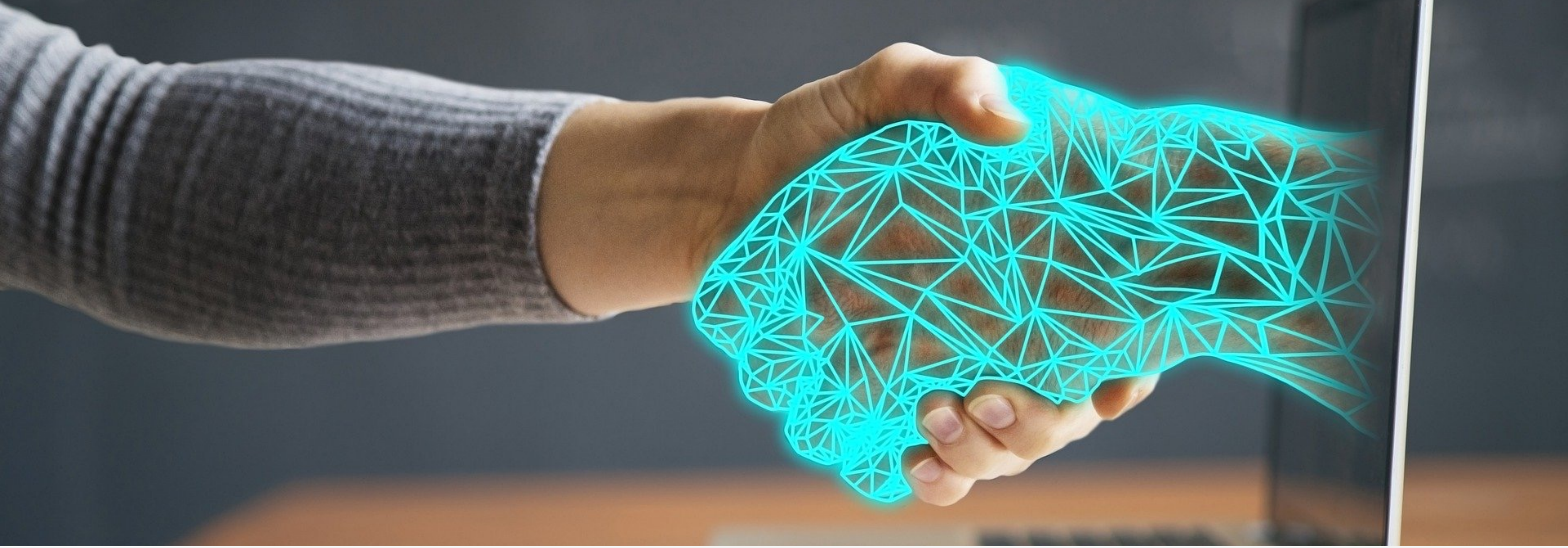
Tools

[AI-Tools for Teaching and Learning]

[Tools for Teachers]

AI Tools

- Claude AI
- ChatGPT
- Gamma.app
- Lucas video creator
- Elevenlabs.io



JKU COOL Lab – Best Practice
Discover – Experiment – Research – Develop

The innovative Teaching-Learning Lab for
Digital Literacy & Computational Thinking

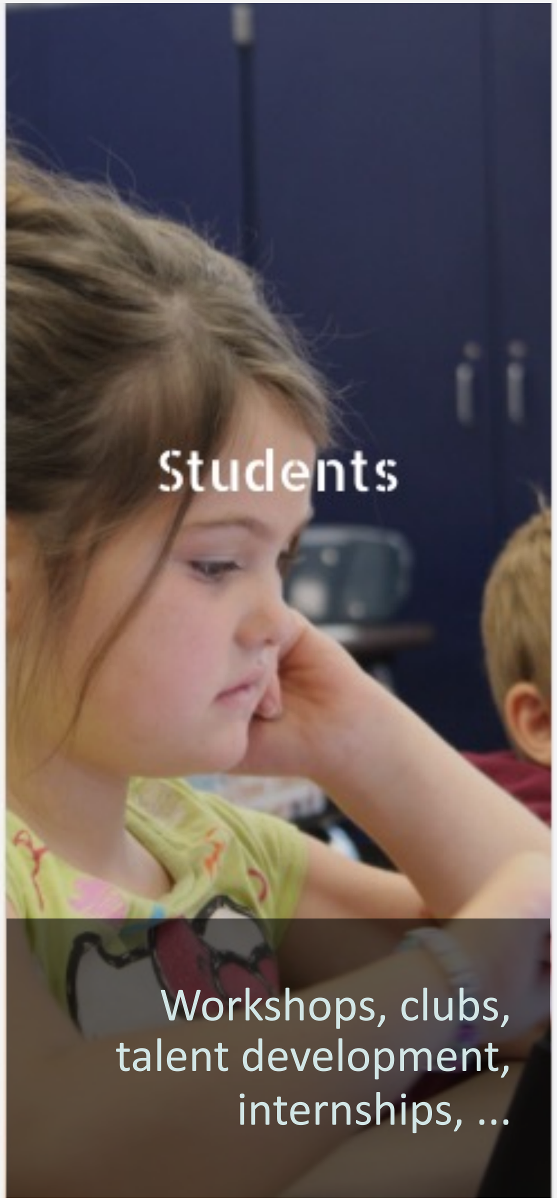
The COOL Lab offers...

schools & school classes

Workshops, theme days, projects, ...

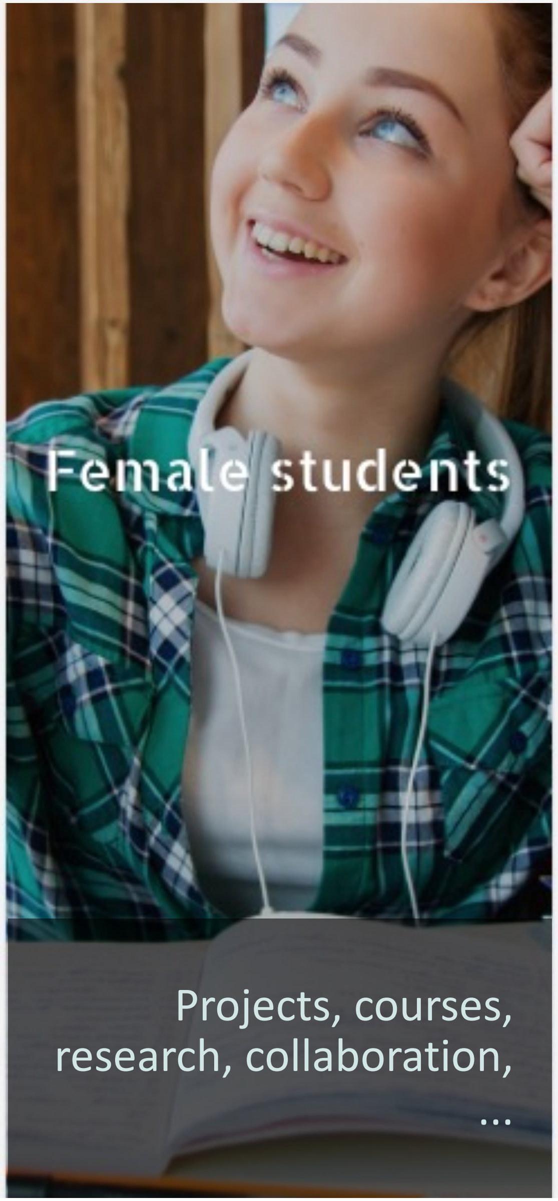
Teachers

Education and training, projects, events for school classes, ...



Students

Workshops, clubs, talent development, internships, ...



Female students

Projects, courses, research, collaboration, ...

COOL LAB MATERIALS & DigiFit4All

for material collection

MATERIAL COLLECTION

- GeoGebra https://www.geogebra.org/u/coollab
    - Books
    - Classroom / Units
- Website https://cool-lab.net
    - Free for everyone
    - For usage in classes
    - Create own material and upload it

Cool Lab

YOUTUBE

- Learning videos (in German)
    - Encoding
    - Algorithms
    - …
- Project videos
    - Circus
    - Let IT Dance
    - Girls* Only

COOL IT = “cool” mixture

Best Practice

How to interweave Computer Science with any other domain and improve learning in all involved subjects

Text Comprehension + Computer Science

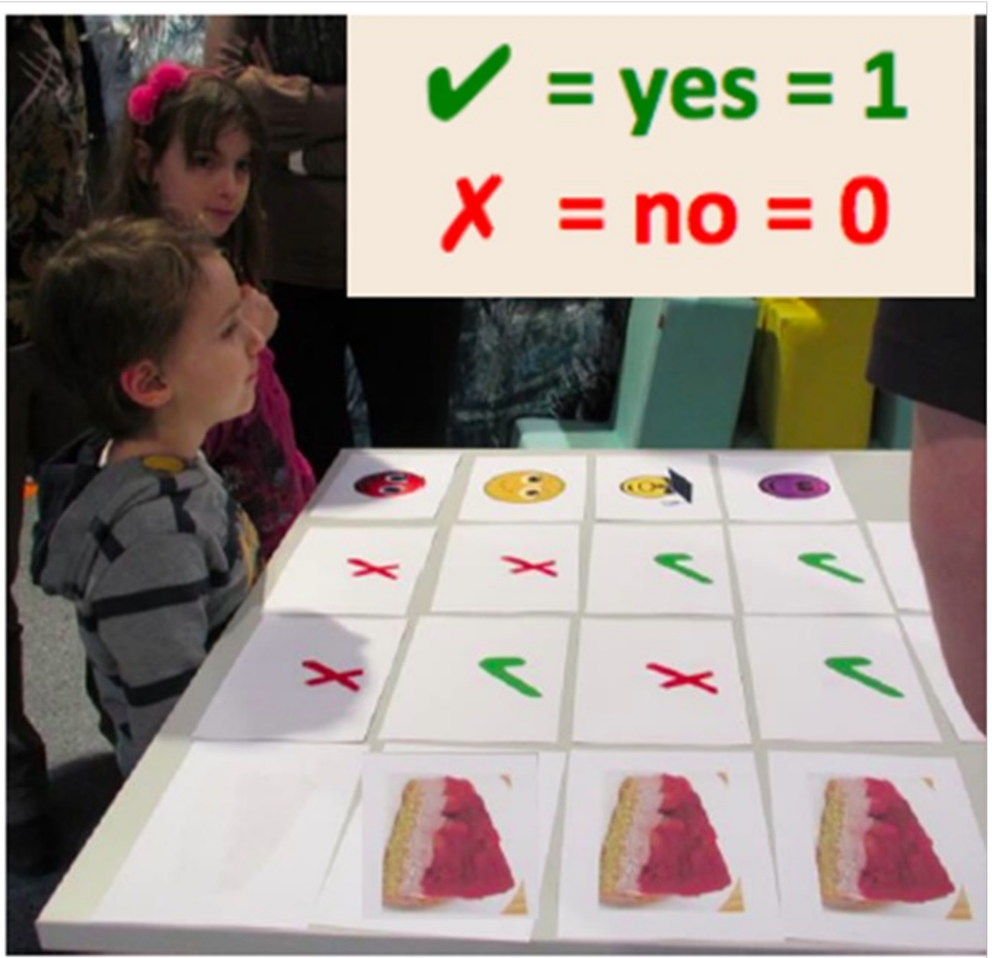


Fig. 1 Truth table for “mask OR gift”

Logik → Hands-on with Cards & more

Maxi‘s birthday is in carnival. He invites some of his friends for a birthday party. The children, who come to the party, wear a mask OR bring a birthday present. All of them who are wearing a mask OR bring a gift get a piece of the cake. The others only drink milk.

- How many pieces of cake and how many cups of chocolate are needed?
- How many pieces are needed when only children who wear a mask AND bring a gift eat a cake.

✓ = yes = 1

✗ = no = 0

Boolesche Algebra & Logic
True or false? Truth Tables: OR

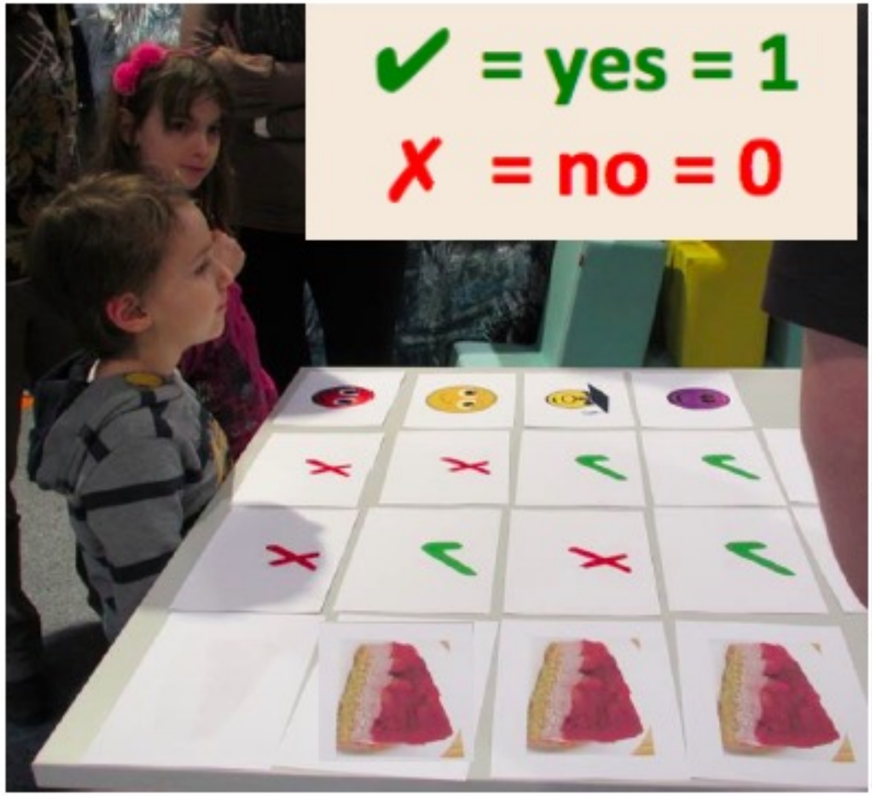


Fig. 1 Truth table for "mask OR gift"

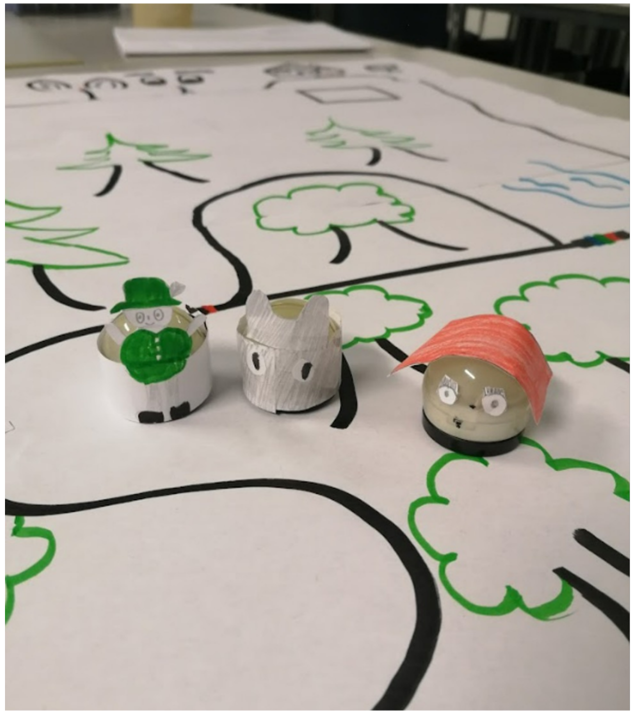
	Mask	Gift	Mask OR Gift
	1	1	1
	1	0	1
	0	1	1
	0	0	0

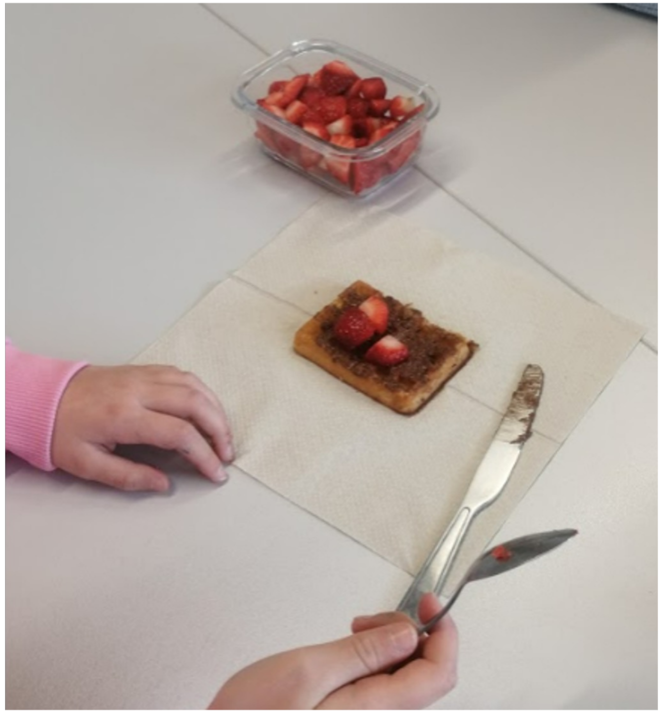
Fig. 2 Truth table with binary numbers

Clear the Ring for Computer Science

GIRLS* ONLY IT CLUB

Target group: gifted girls from 8 to 11 years
Scope: 8 workshops incl. closing event with award ceremony and presentations of all projects
Focus: algorithms, creative programming (retelling fairy tales), robotics workshop
The IT-Club focuses on independent experimentation, research and discovery.





Girls
Only
IT-Club

Fairy Tales

Let IT Dance

Learning by Dancing

Let IT Dance – Aims

The project Let IT Dance! aims **to inspire girls and young women** for the IT sector, computer science and related subjects and to **facilitate the understanding** of often difficult **computer science** and **programming** concepts. In addition, girls are to be educated and sensitized in the field of **cybercrime**.

...

WELCOME TO

Transfer
&
Feedback

Bring Individualization to your lessons

&

Give us feedback through a questionnaire

THANK YOU!

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