



COOL IT

Educating Talents – TLA: Learning through Individualization

COOL Lab – Barbara Sabitzer, Eva Schmidthaler

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Overview



Introduction





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

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.)

COOL IT

COOPERATIVE OPEN LEARNING & COMPUTATIONAL
THINKING FOR EVERYONE &

LEARNING THROUGH INDIVIDUALIZATION

INNOVATIVE PROBLEM SOLVING

Barbara Sabitzer

STEM Education & COOL Lab - Johannes Kepler University Linz
<https://www.jku.at/schule/cool-lab/> <https://www.cool-lab.net/>
barbara.sabitzer@jku.at





1. Discovery

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



2. Individuality

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



3. Cooperation

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



4. Activity

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

COOL IT Framework & Definitions

DICA

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

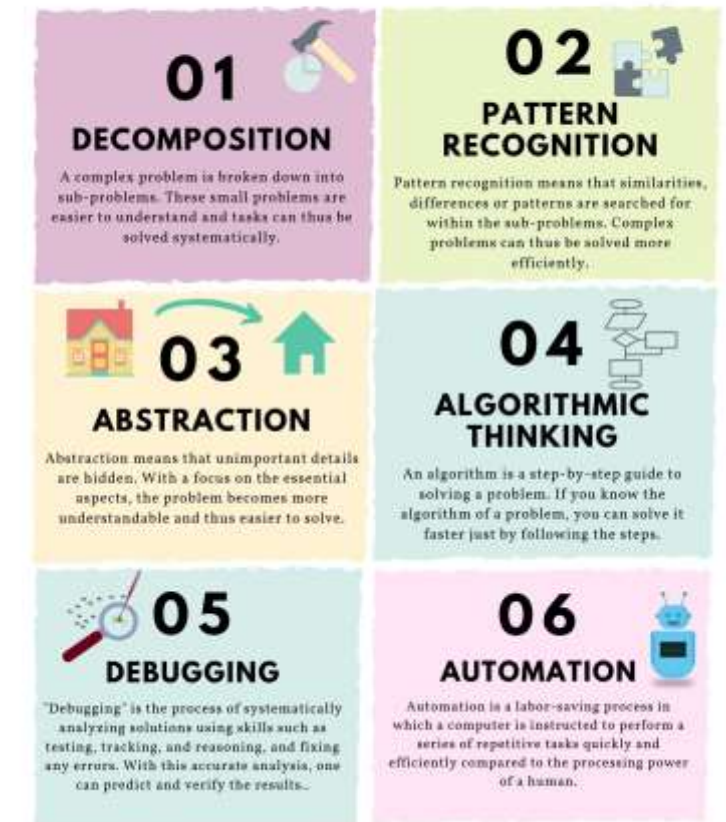
- **I**nstructional **T**echnology & **T**ools
- **I**nformatics **T**eaching & **T**raining
- **I**nnovative **T**eaching & **T**hinking ...

Computational Thinking (CT)

- **A**nalyzing & **S**olving **P**roblems
- **P**attern **R**ecognition & **A**bstraction
- **G**eneralization & **A**lgorithmic **T**hinking ...

COMPUTATIONAL THINKING

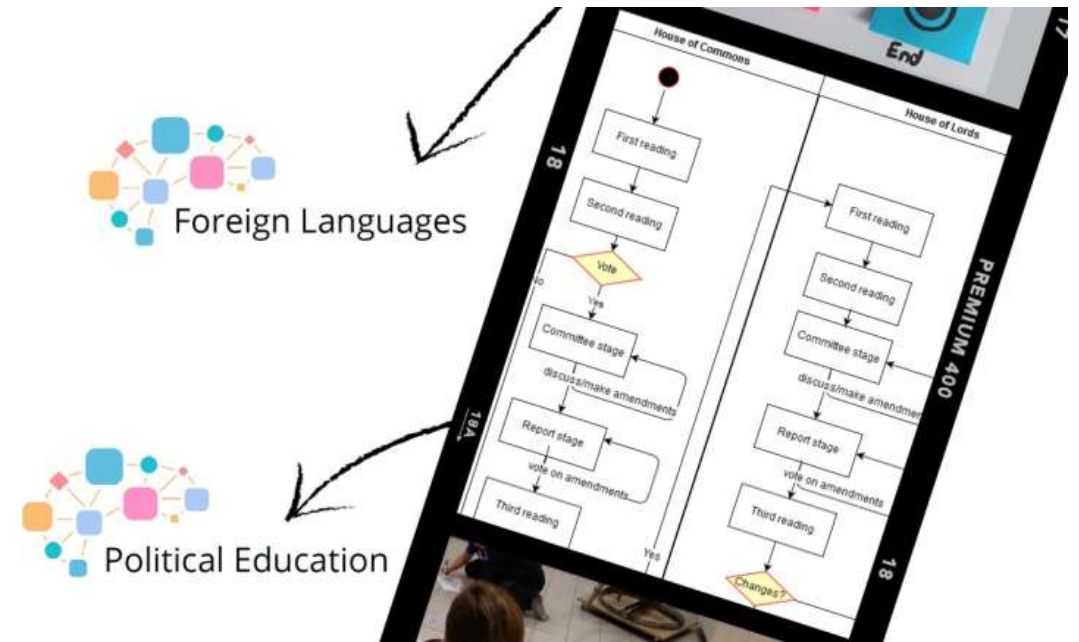
Step by Step



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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

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





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 each learner
(= constructivism)
Learning is an active process
(= progressive education,
e.g. Montessori)

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

```

Pattern Recognition

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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?

READING EXERCISES 2: READING CORNER - CLASSES AND OBJECTS

Reading Corner 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 Student

Student

name : String,
• awake : boolean

+Student(name : String)
+wakeUp()
+getName()
+setName(name : String)

```
public class Day {
```

```
    public static void main(String[] args) {  
        Student student = new Student("Andy");  
        student.setName("Naoori");  
        student.wakeUp();  
    }
```

```
    public static void main(String[] args) {  
        Student student = new Student("Naoori");  
        student.wakeUp();  
    }
```

```
        Student student = new Student("Naoori");  
        student.wakeUp();  
    }
```

Class Day-Main

Fig. 3. Reading corner 1, 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.

Punktevergabe Aufgabenblatt 2

Name: _____

Matr. Nr.: _____

Gesamtpunkte Arbeitsblatt 2:

Teil I

Aufgabe 1 **10** Punkte
Aufgabe 2 **15** Punkte
Aufgabe 3 **15** Punkte

A	B	C	D

Pflichtaufgabe
Pflichtaufgabe
Pflichtaufgabe

Teil II

Aufgabe 4 **15** Punkte
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

A	B	C	D

Pflichtaufgabe

Individualized Assessment

Teil III

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

A	B	C	D

Pflichtaufgabe
Pflichtaufgabe
Pflichtaufgabe
Pflichtaufgabe
Pflichtaufgabe
Pflichtaufgabe
Pflichtaufgabe
Pflichtaufgabe
Pflichtaufgabe

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 Frase 7,8/139, 9-11/140		3	Paesi e nazionalità Italia, regioni, città: Umschlag Europa: 10 <i>Italia: Regioni e città</i>
	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 ...

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
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Vocabolario - MindMaps	1	Io e gli altri io, famiglia, hobby descrivere gli altri professioni, animali 19/142, 21/143
	2	Mi piace hobby e sport strumenti e musica uscire e mangiare moda e ...
	3	Paesi e nazionalità paesi, continenti abitanti, lingue 4/139
	4	Comunicazione tipi, saluti parole e frasi importanti
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 I miei hobby musica preferita, suonare strumenti Il mio sport preferito
	3	Paesi e nazionalità Il mio paese preferito Voglio vivere in ... L'Italia
	4	Comunicazione Cerco amici di penna un'intervista con ...

Individual Feedback by claude.ai

Feedback on Creative Computer Science Introduction for Primary Schools ▾

PDF 2022_JSSEP_... 1.41 MB

give me feedback to my uploaded article BS

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

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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.

CLA Individualization - COOL

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

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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 participation, 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



Hardware & Information Processing Animation Game



We are a computer!

The Computer City

Discovery Learning, Playing

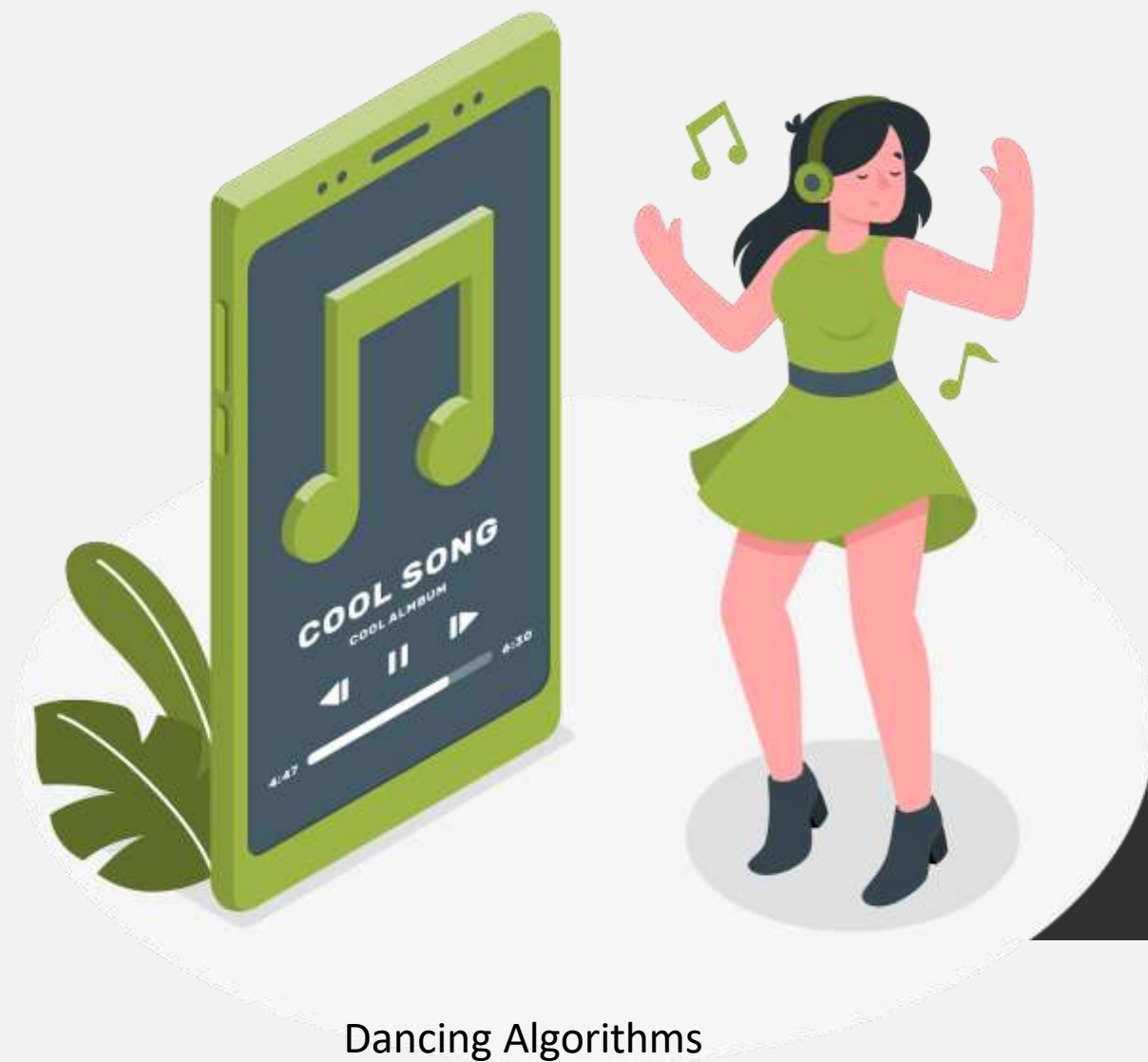


Programming Language for Dancing

↑	Schritt vorwärts	♀	Hände hoch
↓	Schritt rückwärts	♂	Hände runter
→	Schritt rechts	SP	Springen
←	Schritt links	KL	Klatschen

Ein Tanzprogramm könnte zum Beispiel so aussehen:

↑, ♀, KL, ↓, KL, ♂, ←, →, →, ←, ♀, SP, ♂



Dancing Algorithms

Let IT Dance

Learning by Dancing & Moving

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

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

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



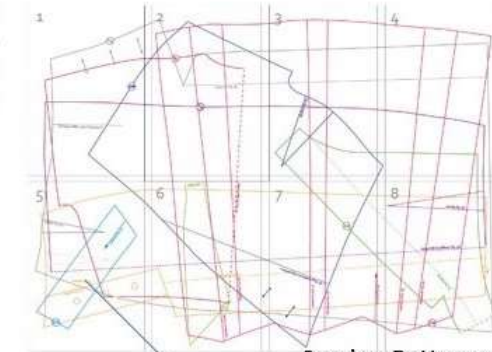
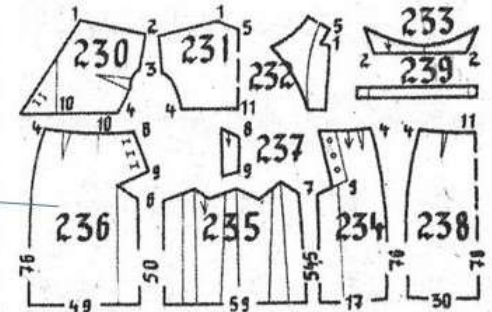
Modeling



Abnäher, Seiten- und Schulternähte schließen. Rechten Vorderteil bei den Knopflöchern verstürzen. Ärmel in den gedoppelten Aufschlag fassen. Kragen in den für sich versäuberten. Die beiden vorderen Rockbahnen an 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 versehen.

Algorithm

Close darts, side and shoulder seams. Turn 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.

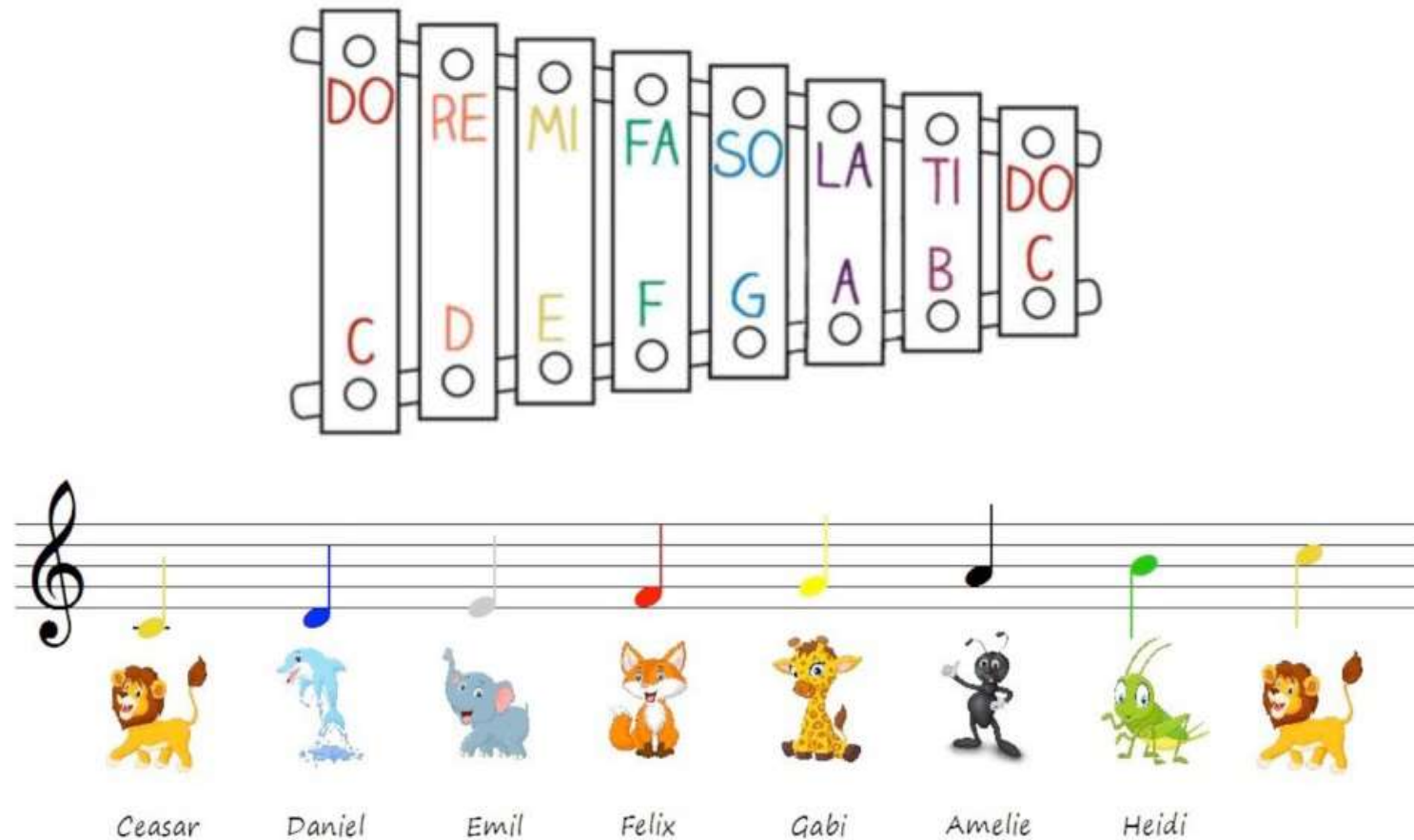


Sewing Patterns

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

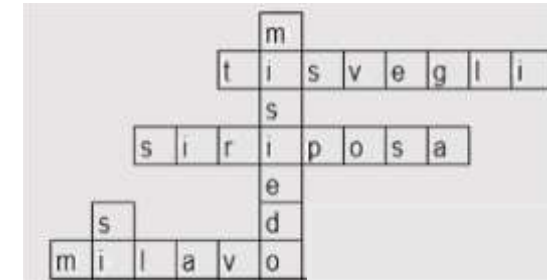
Student 1	Student 2
family	la famiglia
	i genitori
mother	la madre
	il padre
children	i figli
	il figlio
	son

* 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

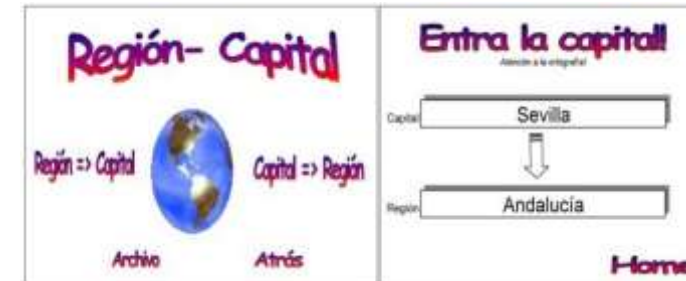
* Scrabble



* 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



* Quartet cards

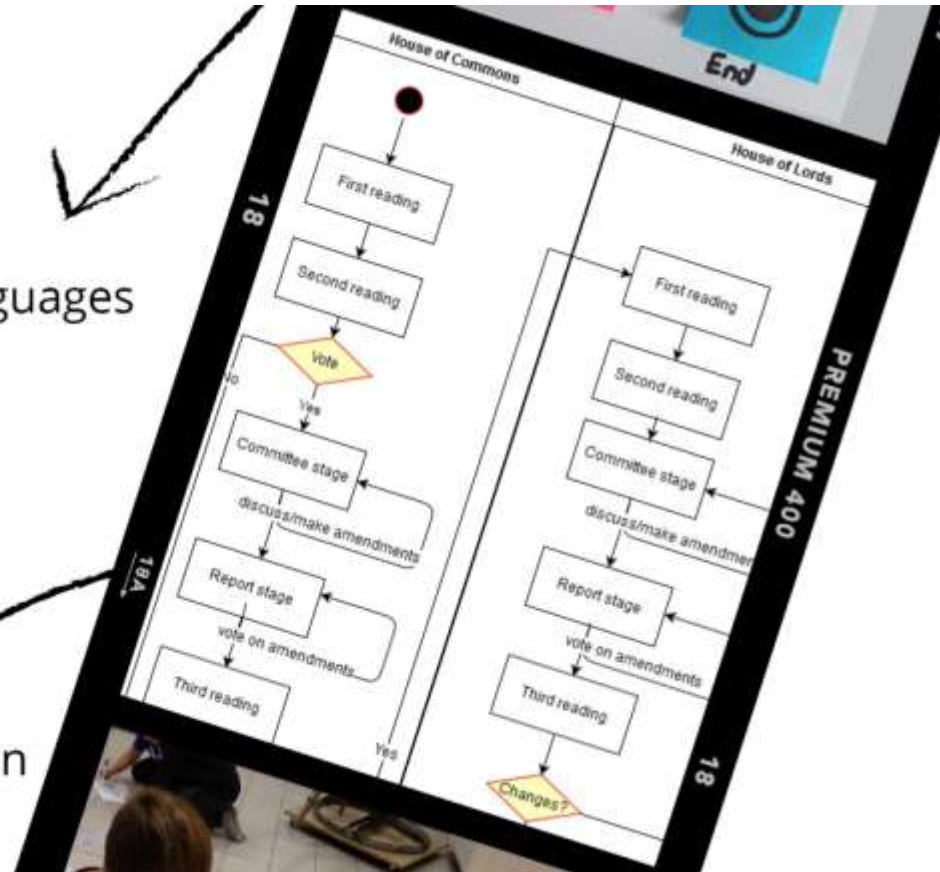
			
Banana Ciliegia Arancia Fragola	Banana Ciliegia Arancia Fragola	Banana Ciliegia Arancia Fragola	Banana Ciliegia Arancia Fragola



Foreign Languages



Political Education



Learning Strategies & Tools

COMPUTATIONAL THINKING

Step by Step

Innovative Problem-Solving

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.

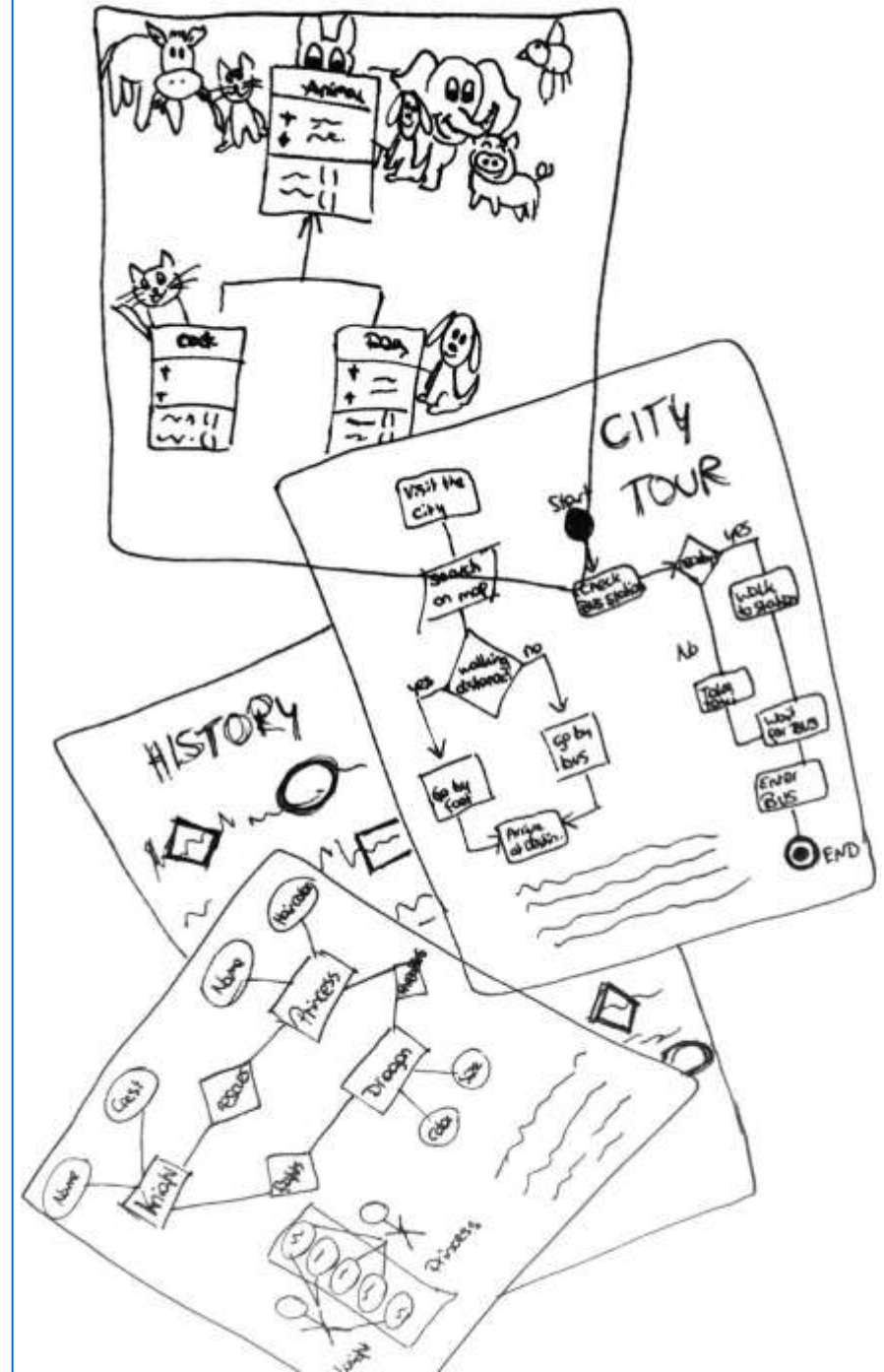
1 – 4 = applied in every problem-solving

5 – 6 = should be integrated everywhere

Modeling

Connecting Computer Science
to Language Education

From Visualizing to Computer Science



Sample Activities: The City Tour Bus

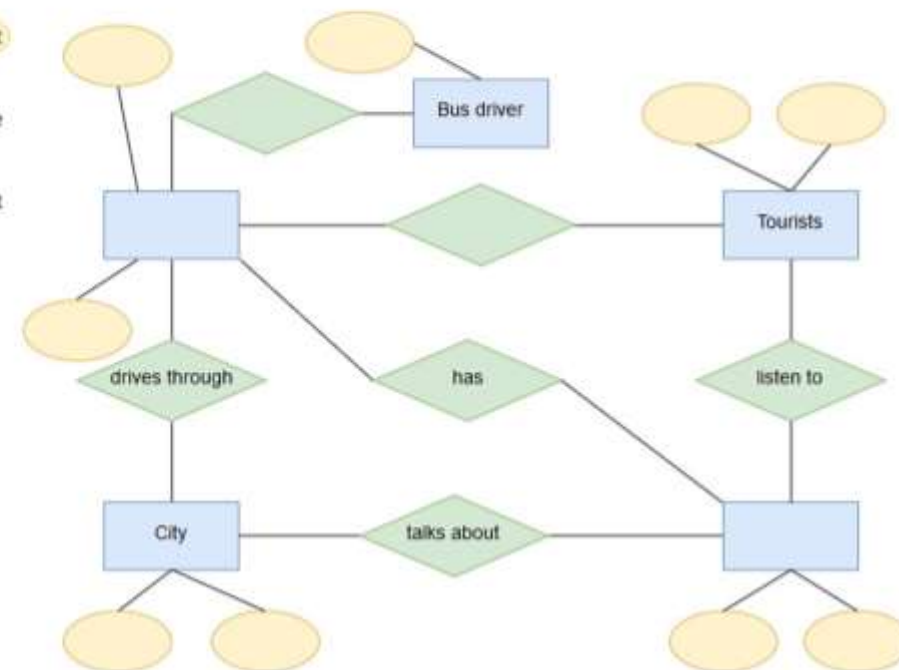
The City Tour Bus

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.



Why are some words highlighted in different colours and shapes?

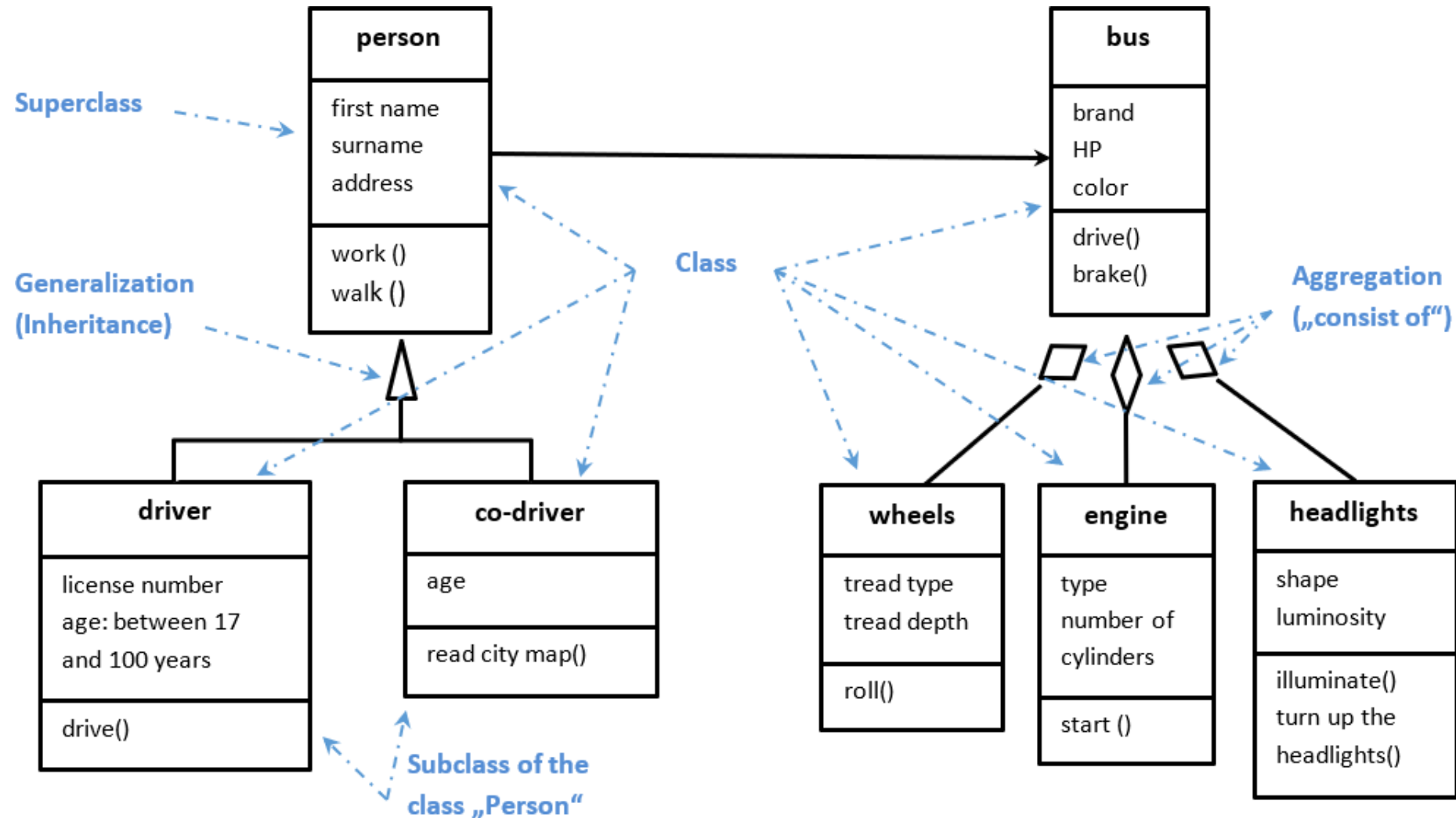
Some of the words fell out of their shapes.
Try to put them back together.



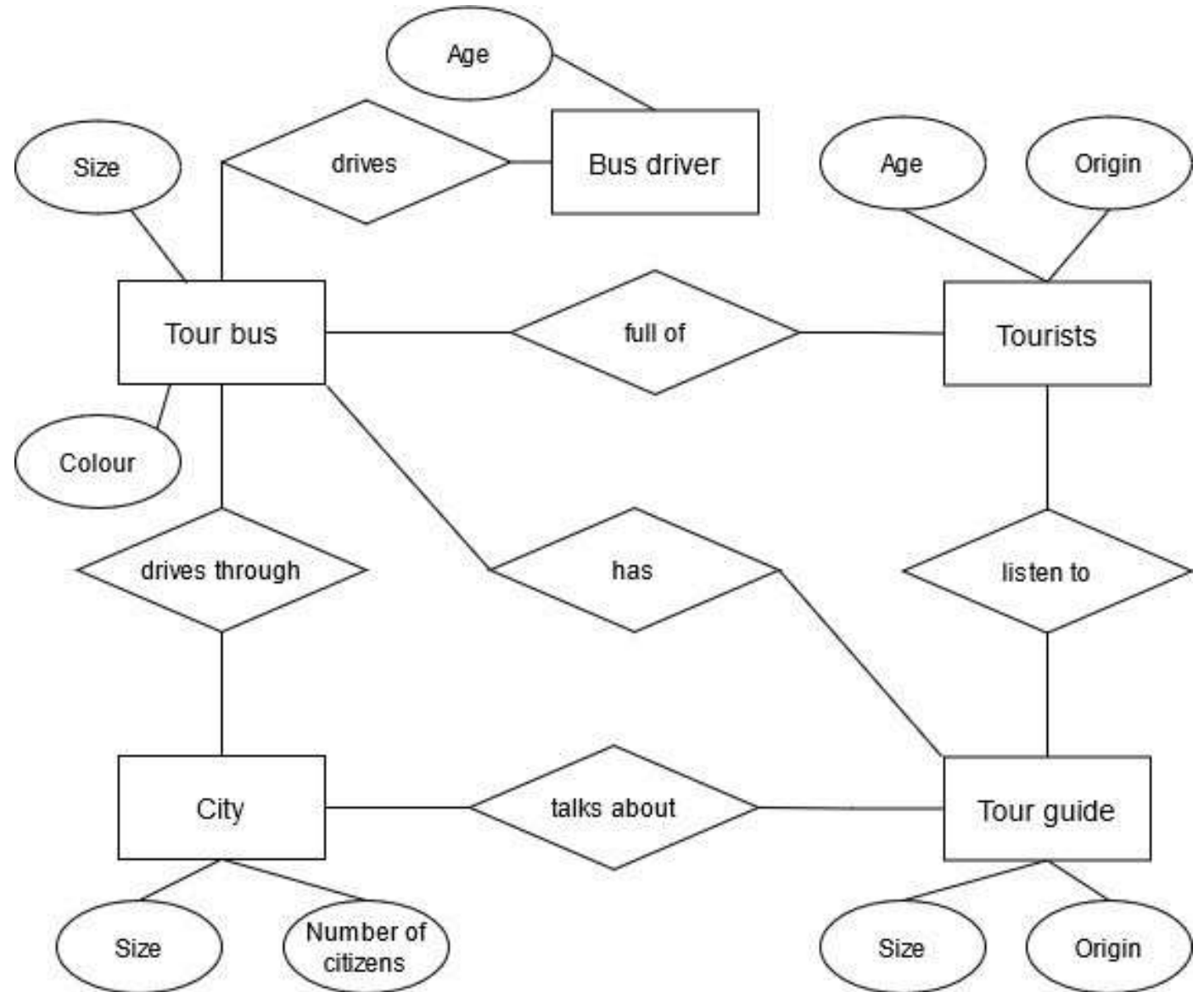
Age (2x)	full of	Origin	Tour bus	Hair colour
Number of citizens	Colour	drives	Tour guide	Size (3x)

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<https://creativecommons.org/licenses/by-nc-sa/4.0/> @166

Sample Activities: The City Tour Bus

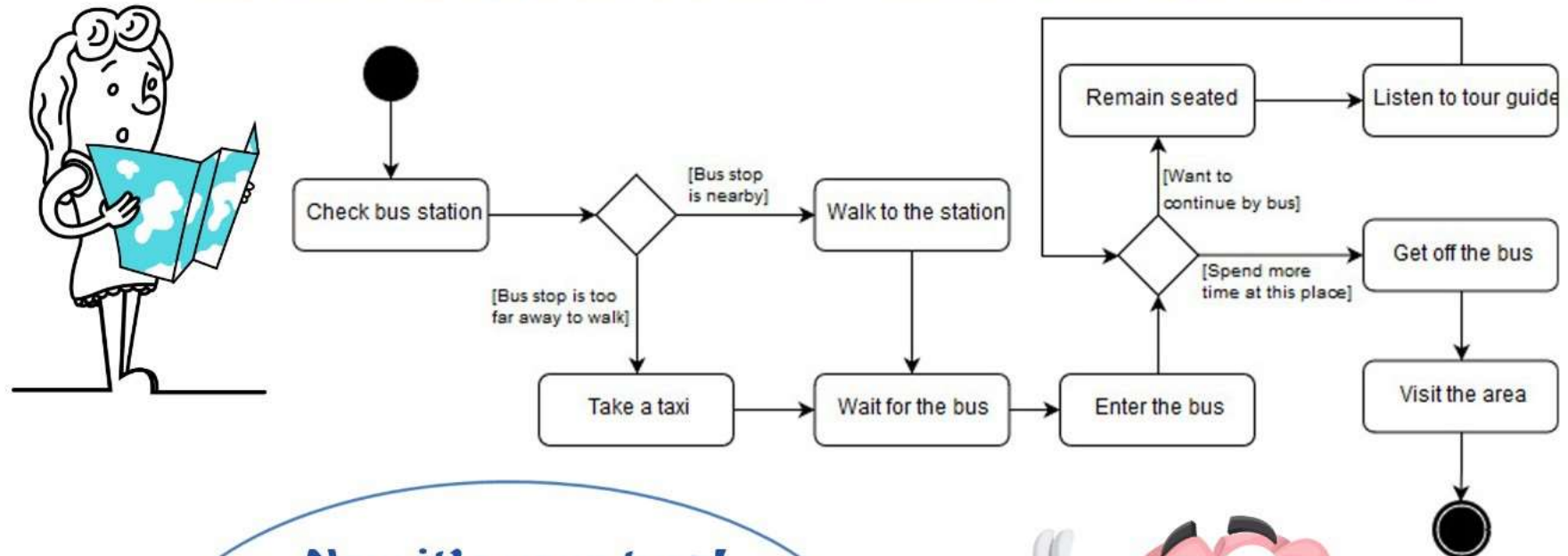


Sample Activities: The City Tour Bus



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.



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





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
я	ich
меня	mich
зовут	man nennt, ruft
мне	mir
двадцать	20
шесть	6
учительница	Lehrerin
русского	russisch
языка	Sprache
учус'	unterrichten
изучаю	studieren
публицистика	Publizistik
	Ort und Zeit
Австрия	Österreich
лет	Jahre
время	Zeit
свободное	frei
сейчас	jetzt
в	in, nach
из	aus
на	in, nach
	sprechen & tun
это	das ist
и	und
живу	leben, wohnen
люблю	lieben
путешествую	reisen

Barbara Sabitzer & Eva Schmidthaler

Modeling supports Vocabulary Acquisition

1 Это я и моя семья - Éto ja i mojá sem'já

Teil 1 -



Это я. Меня зовут Татьяна и я из Ростова-на-Дону. Мне 26 (двадцать шесть) лет. Я учительница русского языка. Сейчас я живу в Крумпендорфе в Австрии и учусь в Клаген-фурте. Я изучаю публицистику. В свободное время я люблю путешествовать.

Éto ja. Menjá zovút Tat'jána i ja iz Rostóva-na-Donú. Mne 26 (dvádcát' shest') let. Ja uchítel'nica rússkogo jazyká. Seichás ja zhivú v Krumpendórfe v Ávstrij i uchús' v Klágen-furte. Ja izucháju publicístiku. V svobodnoe 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.

TLA Individualization - COOL IT



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
это	das ist
я	ich
меня	mich
зовут	man nennt, ruft
и	und
из	aus
на	in, nach
мне	mir
двадцать	20
шесть	6
лет	Jahre
учительница	Lehrerin
русского	russisch
языка	Sprache
сейчас	jetzt
живу	leben, wohnen
в	in, nach

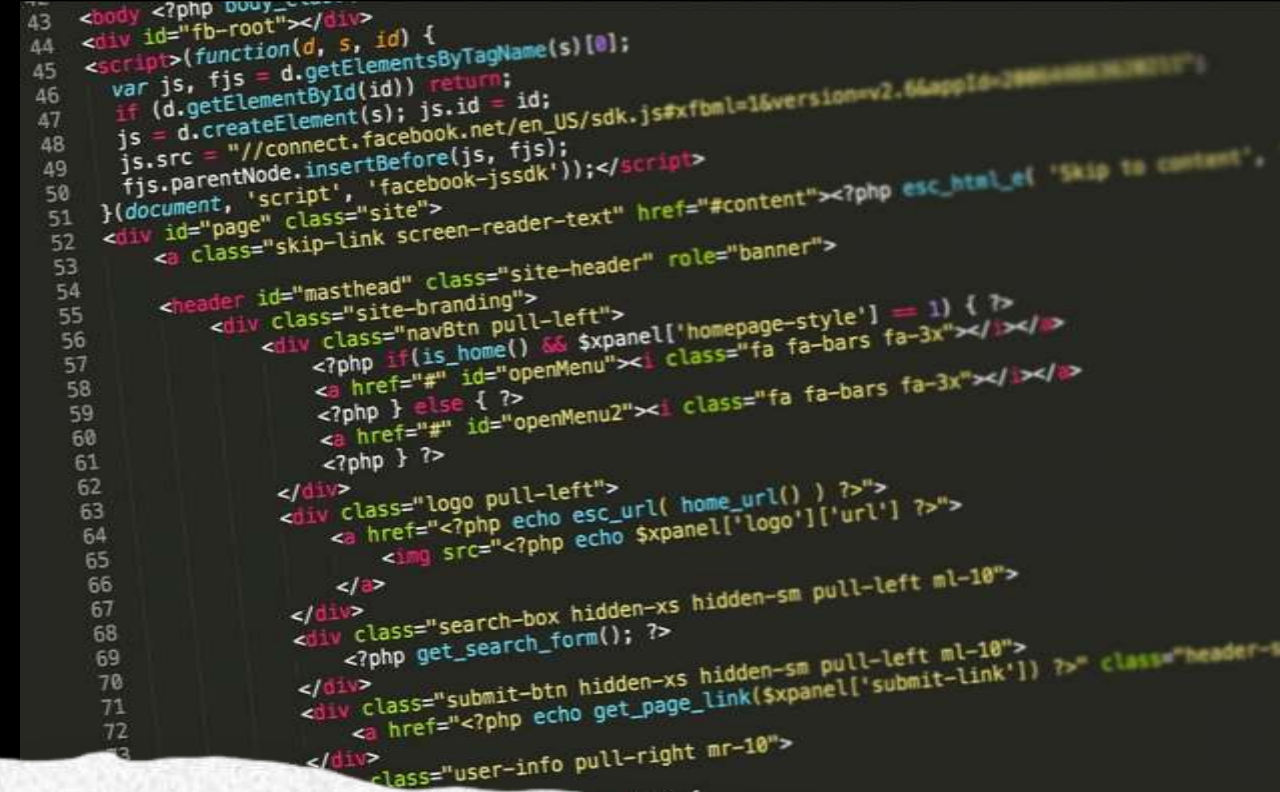
Selected Results

(> 400 students and teachers)

- **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)
 - **Significant 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)

"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. "



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).

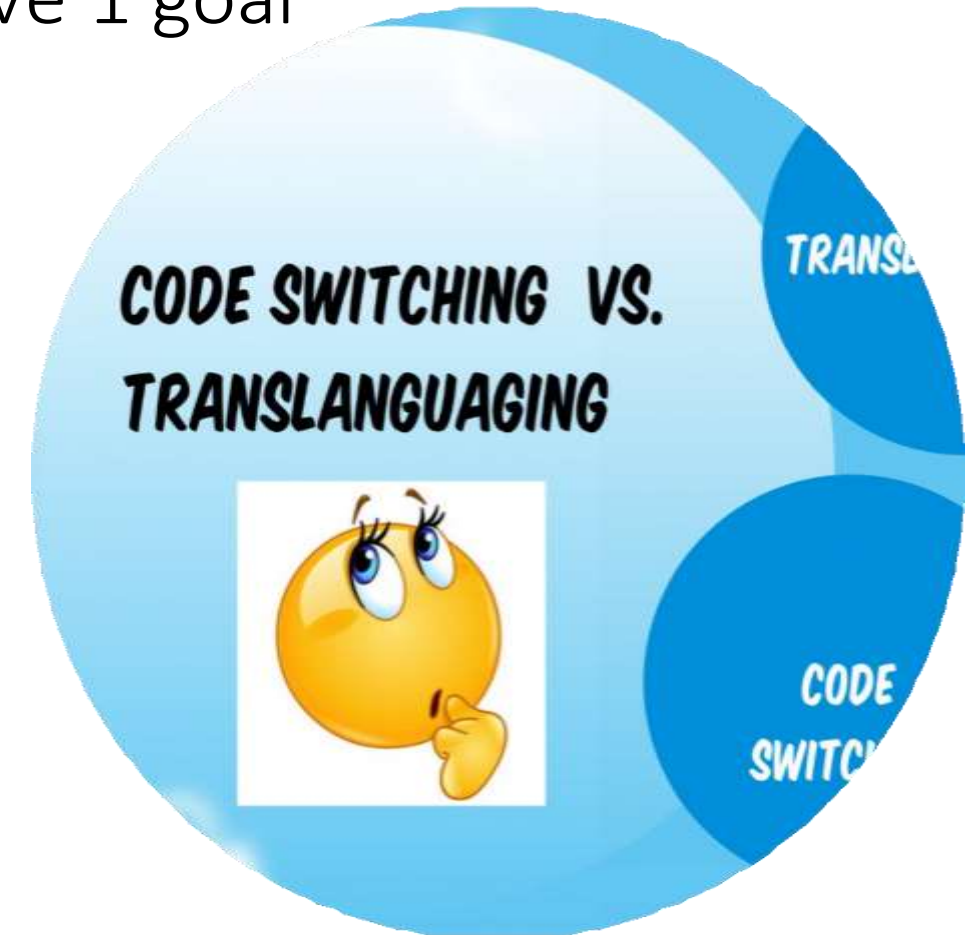
Code switching

in natural situations

Languages can be

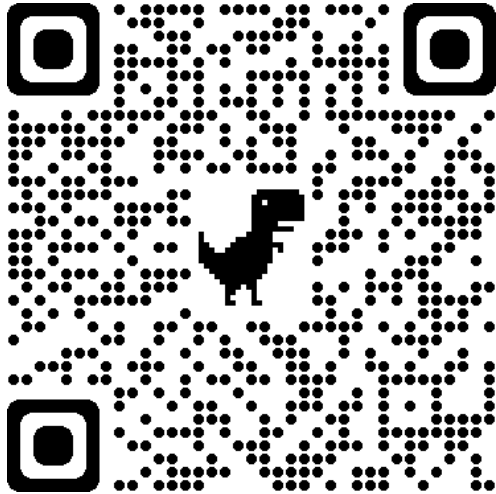
Natural languages, Programming languages ...

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

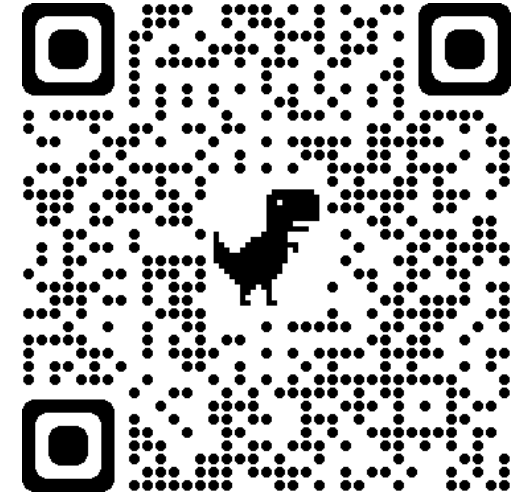


Tools

[AI-Tools for Teaching and Learning](#)

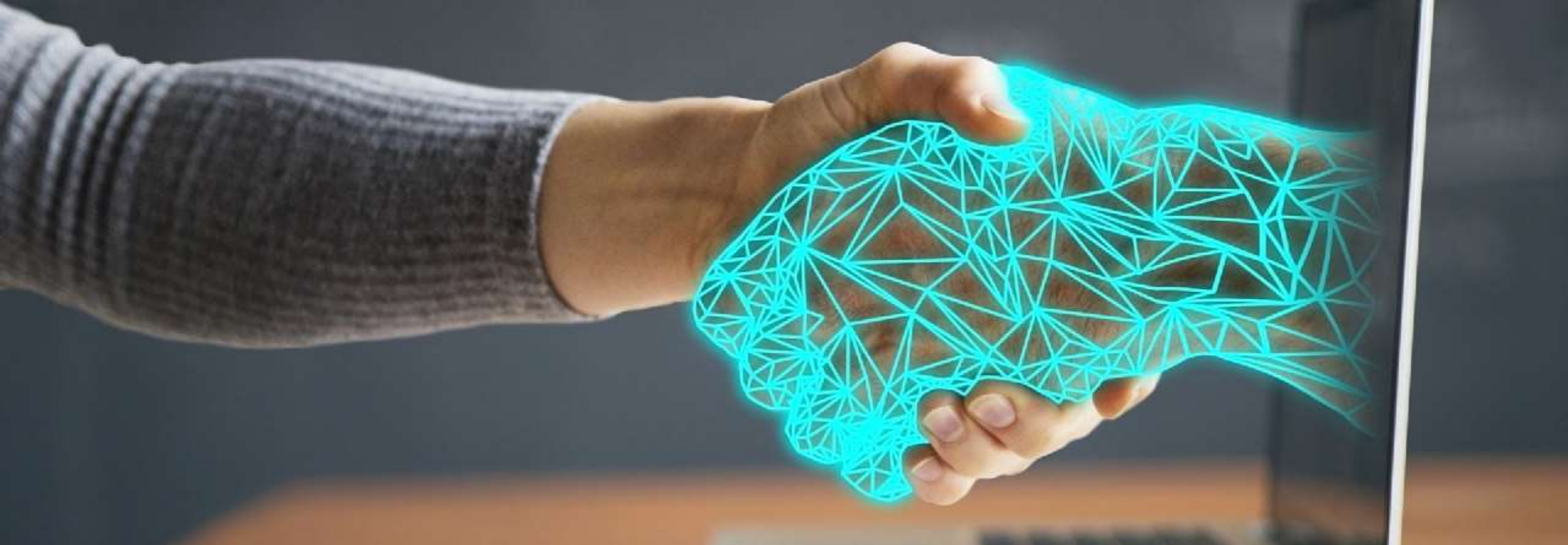


[Tools for Teachers](#)



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...



COOL LAB MATERIALS & DigiFit4All

for material collection



MATERIAL COLLECTION

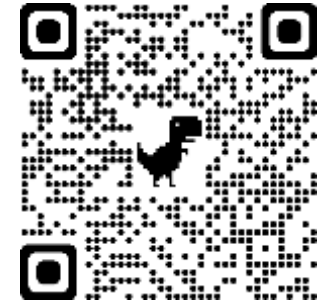
- GeoGebra <https://www.geogebra.org/u/coollab>
 - Books
 - Classroom / Units
- Website <https://cool-lab.net>
 - Free for everyone
 - For usage in classes
 - Create own material and upload it



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

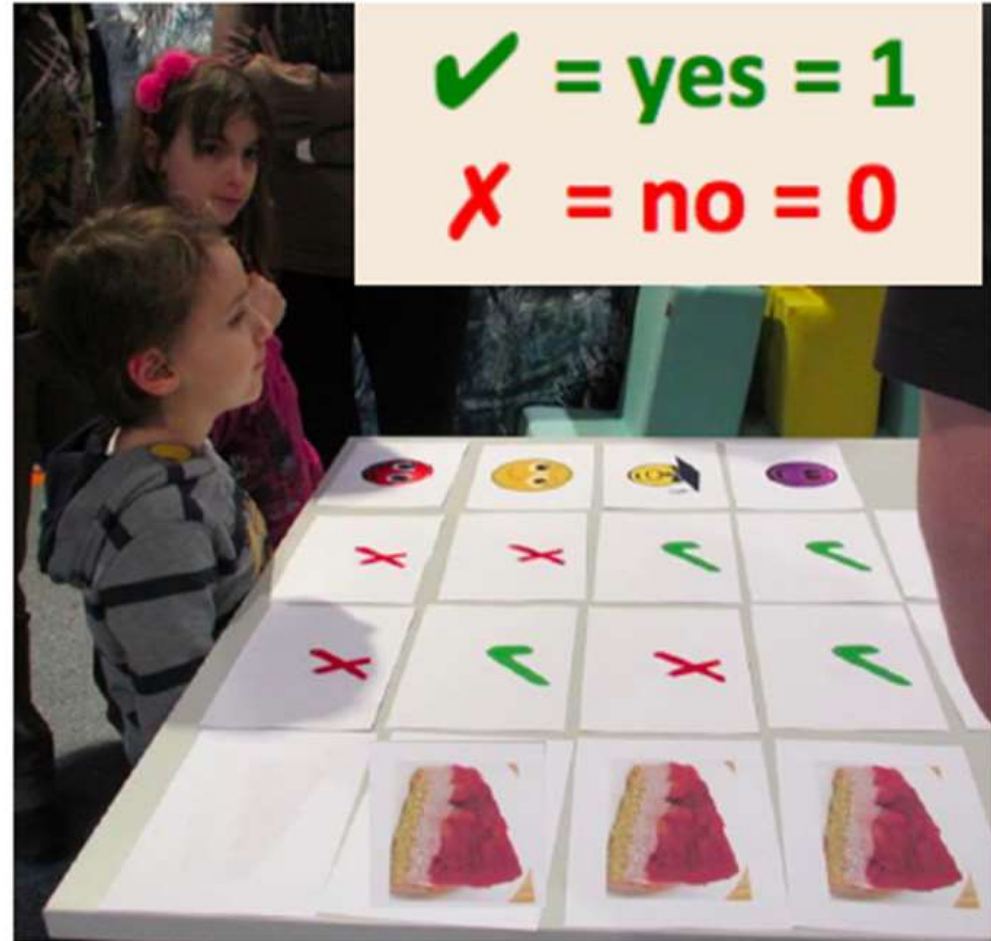


Fig. 1 Truth table for “mask OR gift”

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
X = no = 0



Boolesche Algebra & Logic

True or false? Truth Tables: OR

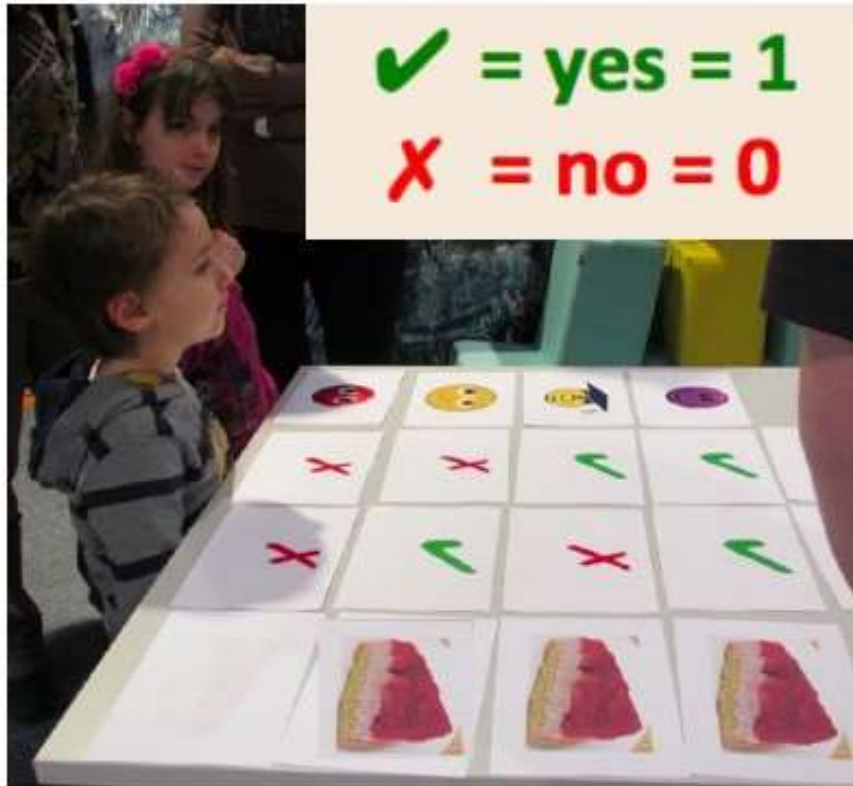


Fig. 1 Truth table for “mask OR gift”





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

Fig. 2 Truth table with binary numbers

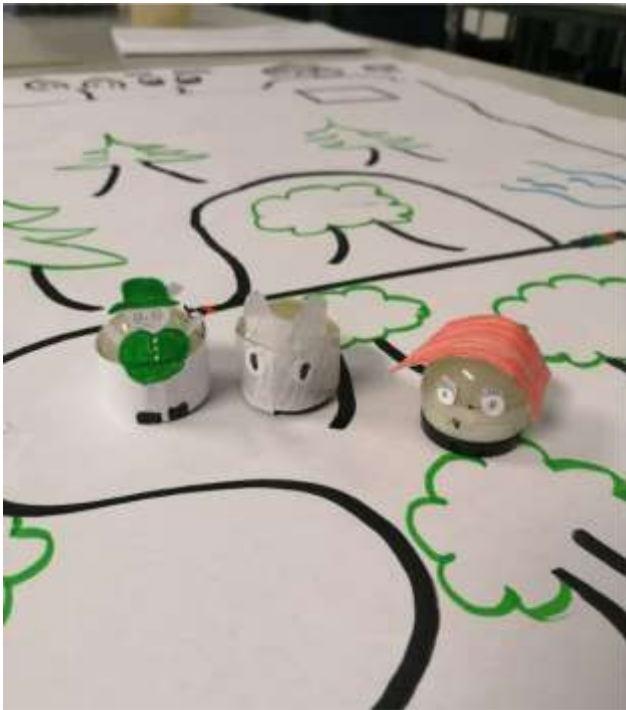


Clear the Ring for Computer Science



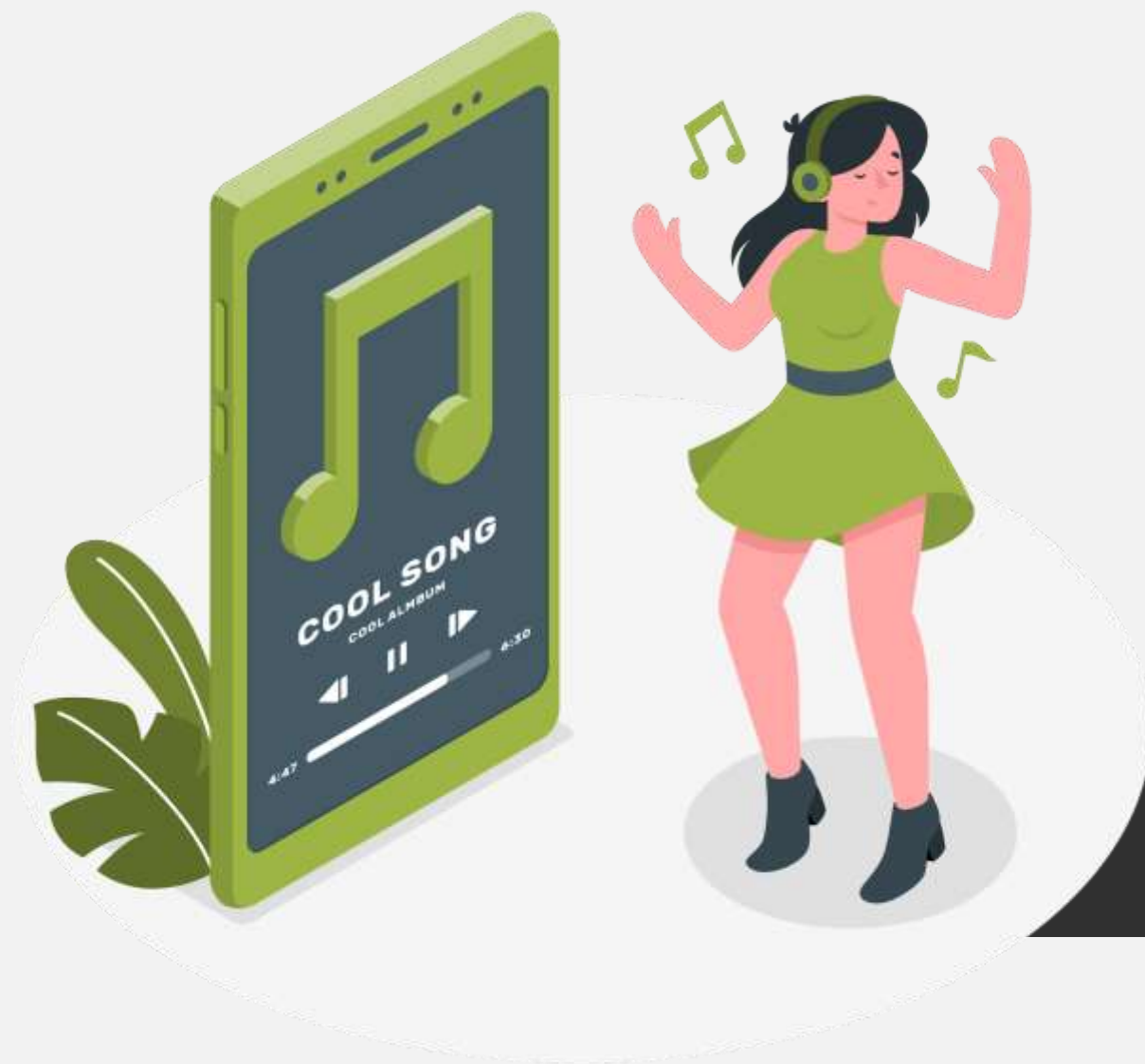
GIRLS* ONLY IT CLUB

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.



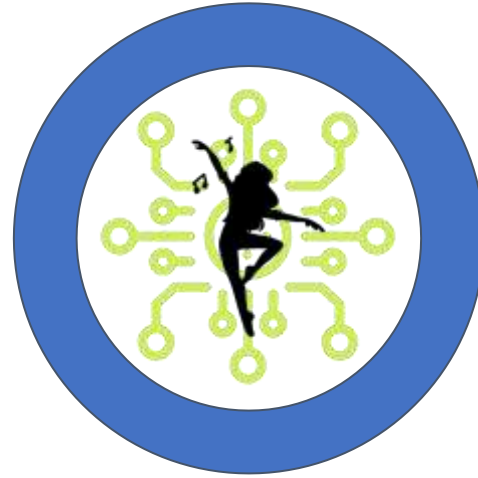
Girls
Only
IT-Club

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!

JKU COOL LAB
+43 732 2468 6870
cool-lab@jku.at
www.cool-lab.net



References

- Baker, C.; Wright, W. E. (2017): *Foundations of bilingual education and bilingualism* (pp. 121-123: Clevedon: Multilingual Matters.
- Cassidy, M. F (1982). Toward integration: Education, instructional technology, and semiotics. *Educational Communications and Technology Journal*, 20(2), 75–89.
- Cenoz, Jasone; Gorter, Durk (2020): Teaching English through pedagogical translanguaging. In: *World Englishes* 39 (2), S. 300–311.
- García, Ofelia; Li Wei (2014): Language, bilingualism and education. In: *Translanguaging: Language, bilingualism and education*: Springer, S. 46–62.
- Harper, Douglas (2021): Online Etymology Dictionary. <https://www.etymonline.com/search?q=technology>
- Huang, Ronghuai; Spector, J. Michael; Yang, Junfeng (2019): *Educational technology: a primer for the 21st century*: Springer.
- Lewis, G., Jones, B., & Baker, C. (2012). Translanguaging: Origins and development from school to street and beyond. *Educational Research and Evaluation*, 18(7), 641-654.
- Rottenhofer, M.; Rankin, T.; Sabitzer, B. (2020). Grammar Instruction with UML. In: 2020 IEEE Frontiers in Education Conference (FIE): IEEE Computer Society, S. 1–5.
- Rottenhofer, M.; Sabitzer, B.; Rankin, T. (2021): Developing Computational Thinking Skills Through Modeling in Language Lessons. In: *Open Education Studies* 3 (1), S. 17–25.
- Rottenhofer, M., Kuka, L., & Sabitzer, B. (2022). Clear the Ring for Computer Science: A Creative Introduction for Primary Schools. In *International Conference on Informatics in Schools: Situation, Evolution, and Perspectives* (pp. 103-112). Springer, Cham.
- Sabitzer, B. (2014): A Neurodidactical Approach to Cooperative and Cross-curricular Open Learning: COOL Informatics. Habilitation. Alpen-Adria-University Klagenfurt.
- Sabitzer, Barbara; Demarle-Meusel, Heike; Rottenhofer, Marina (2020). Modeling as Computational Thinking Language - Developing a Reference Framework. ICEIT Conference Proceedings 2020 by ACM.
- Sabitzer, B.; Groher, I; Sametinger, J; Demarle-Meusel, H. (2020). COOL Programming: Improving Introductory Programming Education through Cooperative Open Learning. In: *Proceedings of the 2020 9th International Conference on Educational and Information Technology*: ACM, S. 95–101.
- Sabitzer, B., & Pasterk, S. (2015). Modeling: A computer science concept for general education. In *2015 IEEE Frontiers in Education Conference (FIE)* (pp. 1-5). IEEE.
- Tickton, Sidney G. (1970): *To improve learning: An evaluation of instructional technology*. New York: R.R. Bowker Company.