



Emerging technologies within the PBS framework

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3 - 3.45 pm CET time



PBS is designed to **enhance academic** and **social behavior** outcomes for all students by

within the PBS framework

(a) **emphasizing** the use of **data** for informing decisions about the selection, implementation, and progress monitoring of **evidence-based** behavioral practices;

(b) **organizing resources** and **systems** to **improve** durable **implementation** fidelity.

(Sugai, Simonsen, 2012)

How can
emerging
technologies
support PBS
implementation?



The use of **Information and Communication Technologies**

can provide efficient automated tools for **collecting data** and **monitoring progresses** during intervention (Glasgow et al, 2004).

Moreover, **technology saves time** and provides more **accurate** and **reliable behavioral records** (Spachos et al, 2014)

... emphasizing the use of data to take evidence-based informed decisions



Information and Communication Technologies can **support** the **educational activities** aimed to **teach appropriate**, alternative **responses**, reducing the incidence of challenging behavior and **increasing** the **skill** level and the **engagement** of students.

... **organizing resources** and **systems** to **improve** durable **implementation** fidelity



1

Health professionals

Access behavioral data and use it to take informed decisions.



2

Teachers

Monitor classroom variables, gather data, and implement interventions



3

Students

Access educational activities mediated by technology and the reports of the monitoring process

ICTs applied to PBS can involve many different actors...

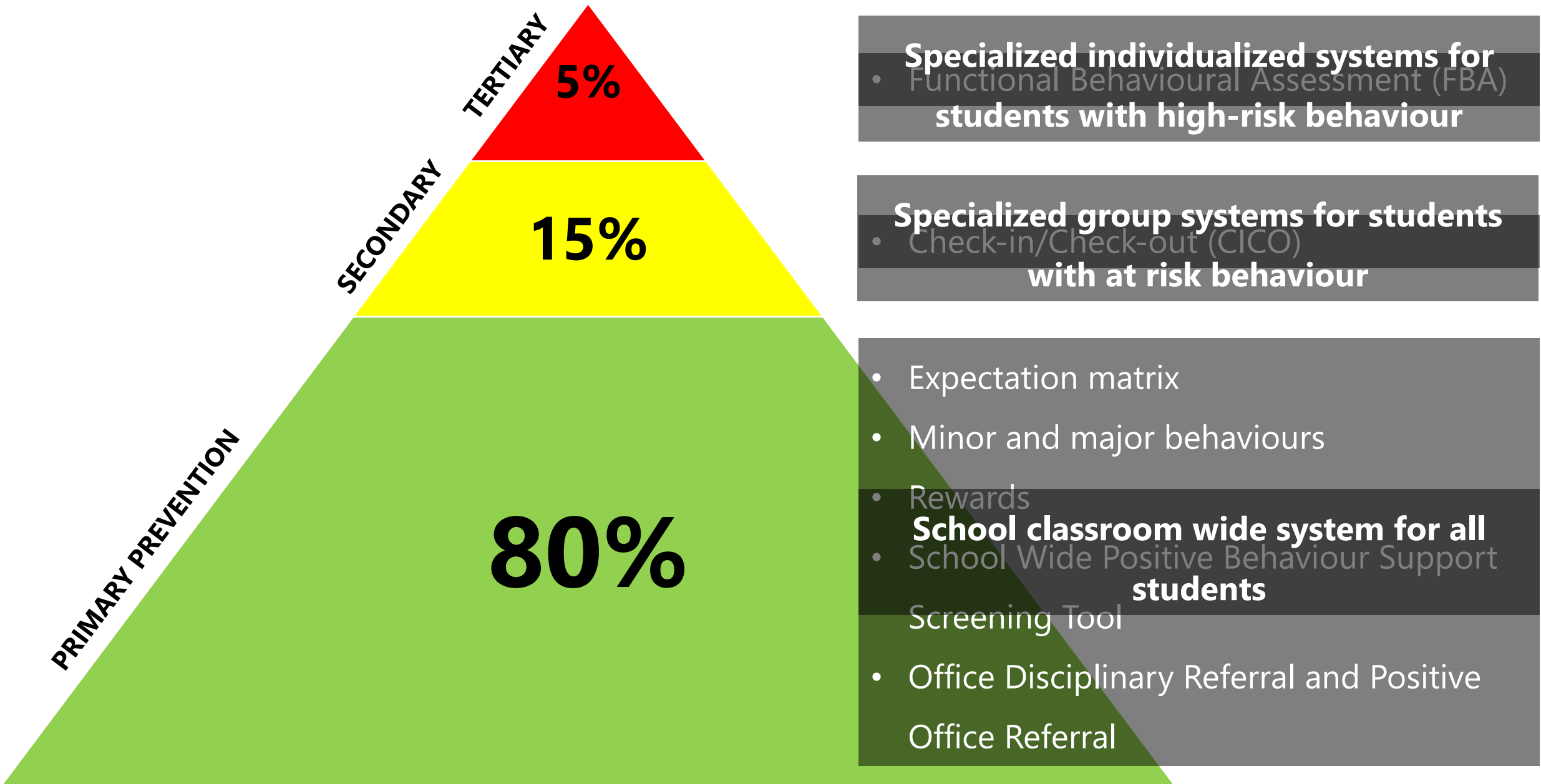
The **BASE application** is
an open source **web
application** supporting
headmasters and teachers
in the implementation of
PBS at school.

BASE

Behavioral Assessment to Improve School Environment

<https://www.baseproj.eu/>

MORE INFO



BASE application: features per tier

Beauty: Bring Equality and AUthenticity To Yourself

Expectations & Locations

Classroom

Be attentive to your environment

Keep the classroom clean and tidy
Make classroom welcoming

Be Authentic

Be on time
Listen attentively

Bathroom

Keep area tidy
Turn off the water

Return to class promptly

It represents the **manifesto** of the school and reflects its most important **values** and **positive behaviours**



Add Minor Behaviors

Name

DELETE

Name

DELETE

ADD

SAVE

It is a **list** of **behaviors** of **minor** and **major** entity



Rewards List

ADD NEW REWARDS!



Favourite sweet

5 points



Favourite sweet

5 points



Small toy

10 points



It is a **list** of **material** and **immaterial incentives** agreed with students with their own relative **«cost»**



REWARDS

SWPBS Expectations Screening Tool

Please evaluate the student:

BBFADD8D

Expectations

Be attentive to your Environment

1 2 3 4 5

Be AUthentic

1 2 3 4 5

SAVE

It is used to **predict behaviours** at **risk**, through a three-points Likert scale evaluation on the **school values**



Positive Office Referral

Student:

BBFADD8D

Fill in date

Locations

- Classroom
- Bathrooms

Positive behaviors

- Keep the classroom clean and tidy
- Be on Time
- Keep area tidy
- Return to class promptly

Note

//

SAVE

They allows to **collect** and **monitor data** about **disruptive** as well as **positive behaviours** of students



Check-in/Check-out

Beauty: Bring Equality and AUthenticity To Yourself

Student:

Your Goal is /

BBFADD8D

Goal percentage

Period number

0

Number of thresholds

1

Threshold

Value

SAVE AND EXIT

It allows to set up a CICO session for a particular student.



PHASES TO BE COMPARED

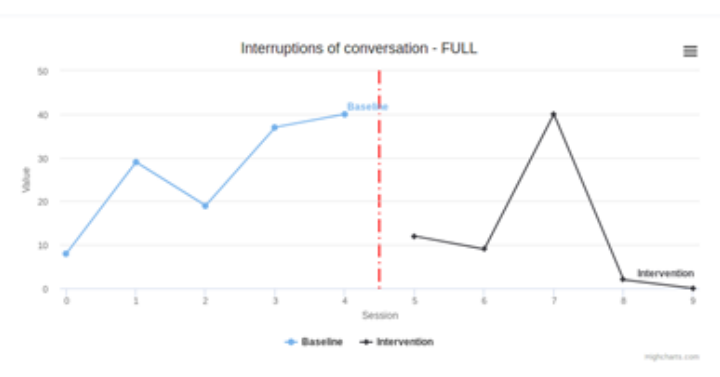
Statistical index ▾



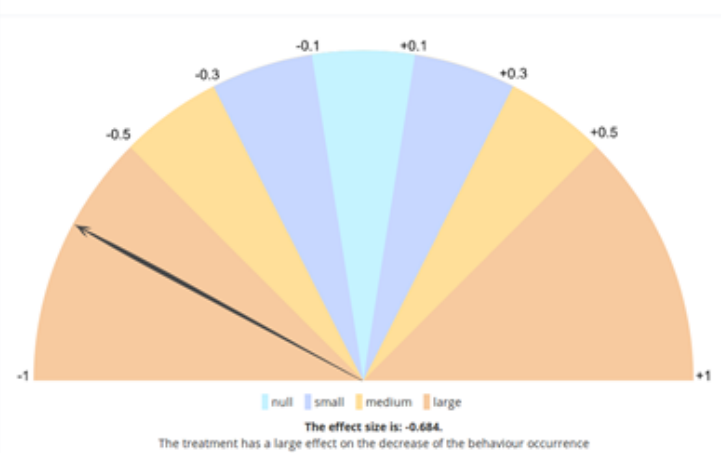
ITEM BE ANALYZED



SCATTER PLOT



SPEEDOMETER: AVSB



It allows to perform **Functional Behaviour Assessment** creating tools for **single case studies** design.

It allows users collect data and analyse them through an R algorithm that uses **TAU-U index** in order to understand the **effectiveness** of an **intervention**



PORs

Rank	Positive Behaviour	#
1	Be On Time	10
2	Keep the classroom tidy	8
3	Wait your turn	4
4	Throw paper into the bin	1

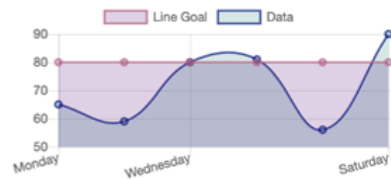
BAR CHART VIEW

ODRs

Rank	Disruptive Behaviour	#
1	Tardy	5
2	Inappropriate Language	3
3	Dress Code Violation	1
4	Noisy	1

BAR CHART VIEW

Cico Session



Rewards List

Assign	Name	Points
<input type="checkbox"/>	New Pen	10
<input type="checkbox"/>	Candy	20
<input type="checkbox"/>	Movie Time	30

Available Points: 30

ASSIGN IT

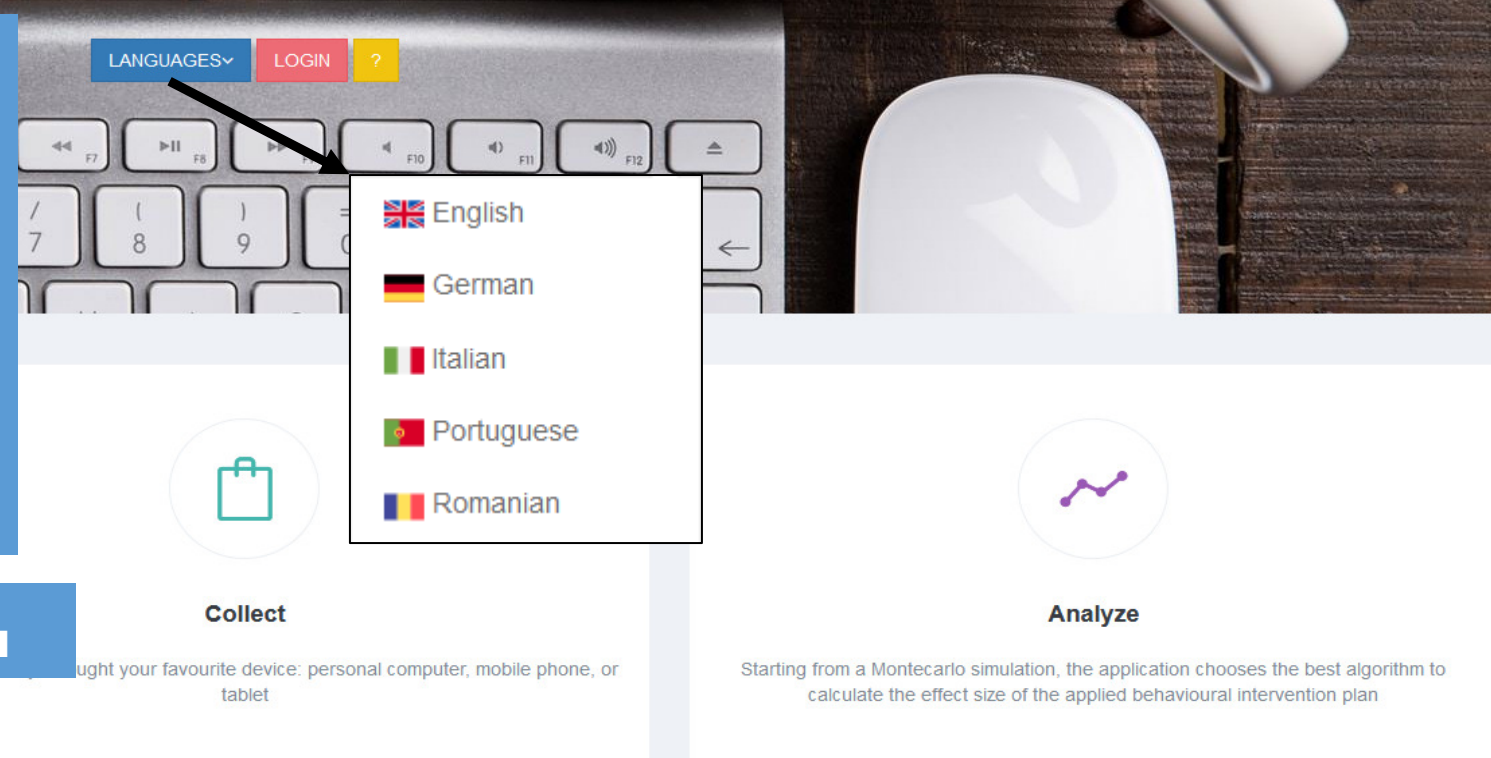
It is made up of **cards** showing **charts, lists** and other **widgets** with the resulting data of each tool

BEHAVE application

AN ICT-BASED SOLUTION SUPPORTING THE OBSERVATION AND THE MANAGEMENT OF PROBLEM BEHAVIOURS

The **BEHAVE application** is an open source **web application** aimed to ease the way for **teachers** to apply **behavioural evidence-based interventions** at school.

<https://app.behaveproject.eu>



The screenshot shows the top navigation bar of the BEHAVE application. It includes a 'LANGUAGES' dropdown menu, a 'LOGIN' button, and a help icon. The dropdown menu is open, displaying the following options:

- English
- German
- Italian
- Portuguese
- Romanian

Below the navigation bar, the interface is divided into two main sections:

- Collect**: Represented by a shopping bag icon. Below the icon, it says "Choose your favourite device: personal computer, mobile phone, or tablet".
- Analyze**: Represented by a line graph icon. Below the icon, it says "Starting from a Montecarlo simulation, the application chooses the best algorithm to calculate the effect size of the applied behavioural intervention plan".

ARE YOU AN EXPERT IN
BEHAVIOUR MANAGEMENT?




A dark wooden desk with school supplies including pens, pencils, paper clips, and sticky notes. The text "STEP 1: Student creation" is centered on the desk.

STEP 1:
Student creation

Students


LIST +



test

edit view share delete

A **student's name** must be inserted to start the **behavioural monitoring process**. Students are characterized by id's or nicknames to guarantee the **safety** of pupils' **personal data** conditions.



STEP 2:
Measure creation

Compose your measure

Name*

Description*

+ Add item Submit Cancel

- Choice
- Direct Observation
- Integer
- Four Quadrant Diagram
- Range
- Text

Widget typology	Description	Validation rules
Choice	The widget creates a radio buttons and a selection process. Multiple selections of values are allowed.	The values sent from the form have to be the same as those included in the lists.
Direct observation - duration	The widget is designed to measure the duration of a phenomenon.	The values sent from the form have to be in the timestamp format.
Direct observation - frequency	The widget is aimed to count the occurrences of a phenomenon.	The values sent from the form have to be in the timestamp format.
Integer	The widget is aimed at supporting the creation of items with a numeric response.	The value sent from the form has to be an integer.
Four quadrant diagram widget	The widgets is intended to create a cartesian plane. The user has to select the point in the plane where he feels to belong according to the predefined categories.	The values sent from the form are 2 integers, 1 for the x axis and 1 for the y axis.
Range	The widget is intended to create an input with a numeric value which must be no less than a given value, and no more than another given value.	The value sent from the form is included in the planned range.
Text	The widget is intended to create a textual input.	The value sent from the form must be a textual type.

Text abc

What happens next, or as a result of the child's behavior?*

Describe the consequence of the behavior

Submit Cancel

Integer

How many spelling errors he made?*

Submit Cancel

Meter

Mood meter *

Submit Cancel

Duration

Interruption of conversation ⏸*

Submit Cancel

choice test

What is your favourite color?*

yellow

blue

red

Submit Cancel

Range test

How many times he calls out in classroom?*

0 10

Submit Cancel

Compose your measure

Name of the measure*

Description*

Import items ?

Browse... No file selected.

+ Add item Submit

1

Import measure

File*

Browse... No file selected.

Submit

A dark wooden desk with school supplies including pens, pencils, paper clips, and sticky notes. The text is centered on the desk.

STEP 3:
Plan the observation

New observation

No Single case?

Name*

Description*

Place

Setting

Measure*

Filling instructions

Schedule observation dates*

Repeat option

every n week(s)

Weekly days of week

Repeat end option

Nr. occurrences

Submit

Cancel

Students

CALENDAR

< > TODAY MONTH WEEK DAY

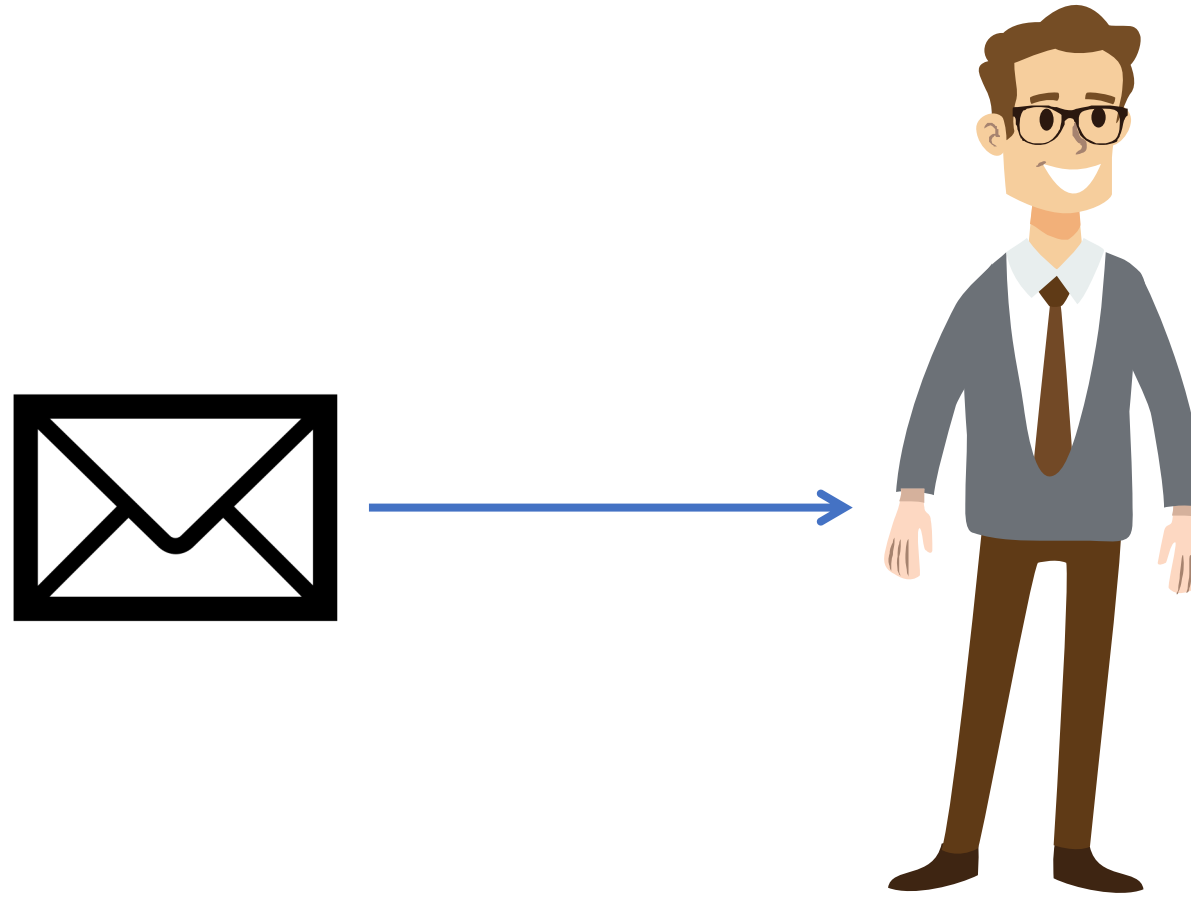
May 2019

SUN	MON	TUE	WED	THU	FRI	SAT
28 10a Interruption of d	29 10a Interruption of d	30	1 10a Interruption of d	2	3 10a Interruption of d	4
5 10a Interruption of d	6 10a Interruption of d	7	8 10a Interruption of d	9	10 10a Interruption of d	11
12 10a Interruption of d	13 10a Interruption of d	14	15	16	17	18
19	20	21	22	23	24	25

The **behaviour** has to be defined describing the behaviour in a **specific way** that makes it possible to **identify** the same behaviour when observed by different people.

A dark wooden desk with stationery items: pens, paper clips, and pencils.

STEP 4:
Data collection



The “observer” will receive a notification via email to remind him to collect the data at the right time.

Data gathering about test

🏠 Interruption of discussions during the class

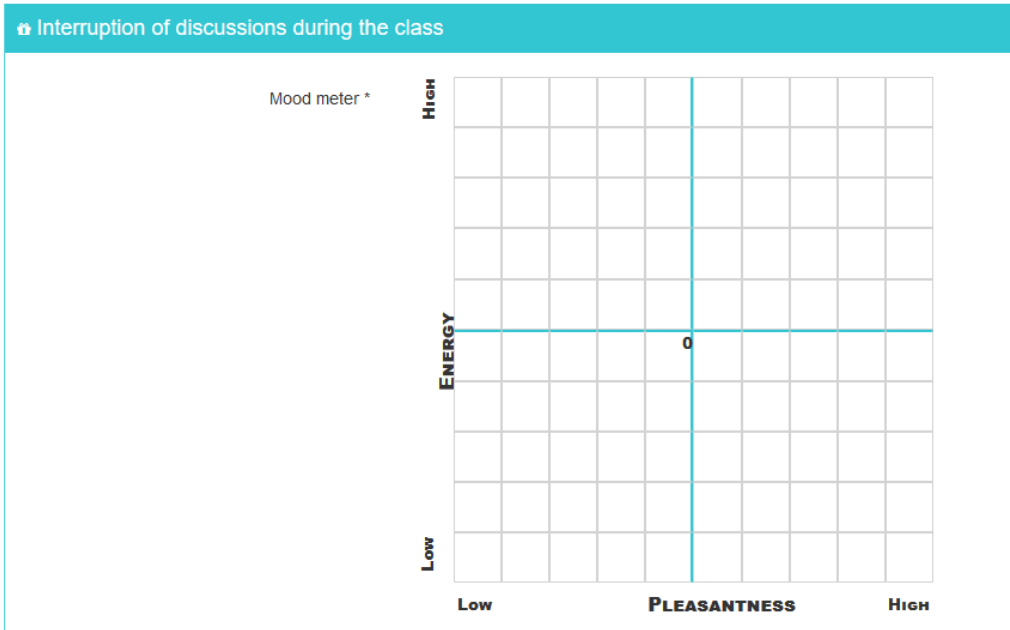
Interruptions*

Data gathering about test

🏠 Interruption of discussions during the class

How many times?*

Data gathering about test



Data gathering about test

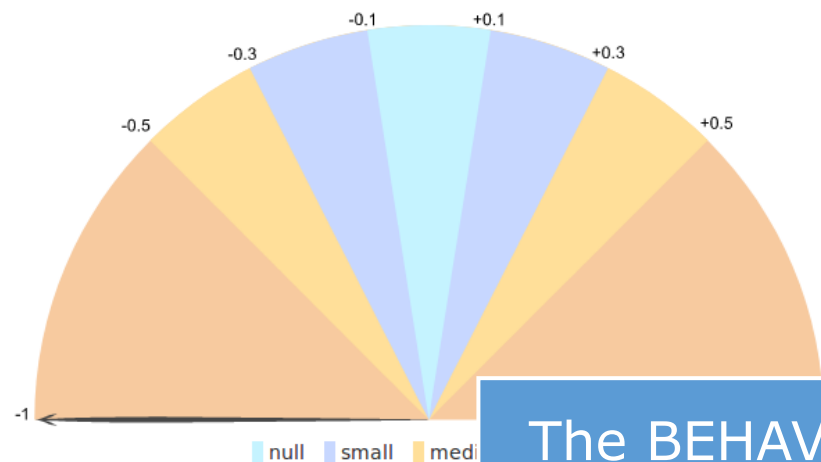
🏠 Interruption of discussions during the class

How many times?*

A top-down view of a dark wooden desk. In the top left, there's a green pen and two blue pens. In the bottom left, several blue and green paper clips are scattered. On the right side, there's a green sticky note, and a cluster of colored pencils in blue, yellow, green, and purple. The text "STEP 5: Data analysis" is centered in white.

STEP 5:
Data analysis

SPEEDOMETER: AVSB



The effect size is...
The treatment has a large effect on the de...



The BEHAVE application supports both **visual** and **statistical analyses**. It calculates the **best algorithm** according to the provided **dataset**.

PARKER'S TAU-U Partition and Full Matrices

	TREND A	TREN	
n pairs	6	10	
n pos	2	4	
n neg	4	5	29
S	-2	-1	-23
Tau	-0.333	-0.1	-0.639
SDs	2.944	3.958	9.539
VaRs	8.667	15.667	91
Z	-0.679	-0.253	-2.411
p(Z based)	0.497	0.801	0.016
r Effect Size	-0.499	-0.156	-0.843

TREND B A vs B + TREND B - TREND A

			36
			8
n neg	20	25	27
S	-20	-21	-19
Tau	-1	-0.7	-0.528
SDs	8.131	9.083	9.539
VaRs	66.111	82.5	91
Z	-2.46	-2.312	-1.992
p(Z based)	0.014	0.021	0.046
r Effect Size	-1	-0.891	-0.737



The AUGMENTED REALITY INTERACTIVE EDUCATIONAL SYSTEM

To Study the introduction
of Augmented Reality in
PBIS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 856533.



What is the ARETE project

It is an EU-funded project aimed to build a Europe-wide competitive ecosystem that supports fast dissemination of augmented reality learning content in three key educational scenarios:

STEM

English literacy skills

Positive Behaviour Intervention and Support (PBIS)

<https://www.areteproject.eu>



Partners



University College Dublin (UCD) (Coordinator)	CleverBooks (CLB)	Wordsworth Learning (WWL)
Stichting VU (SVU)	University of Leicester (ULE)	EUN Partnership AISBL (EUN)
The Istituto per le Tecnologie Didattiche (CNR)	The Julius- Maximilian- University Würzburg (UNI WUE)	Vicomtech (VIC)
	The Open University (OU)	



Research aim and activities of PBS research scenario

- The research investigates how AR impacts upper primary students' behavioural management and self-management skills in school settings.
- It includes the development of an Interactive AR component conceived as a mobile App (PBIS-AR app) and supports the development of social behaviour skills via teaching and practicing expected behaviour within the framework of School-wide Positive Behavior Interventions and Supports (SW-PBIS).
- A pilot will validate innovative teaching scenarios where AR is embedded in a series of behavioural lessons and study the effect on students' social skills and regulatory behaviour.

What the AR is?

- Digital information overlays on top of the physical world to create an interactive space where users can explore, discover, interact, and learn. (Craig, 2013)
- AR is accessible by a variety of devices: traditional computers, tablets mobile phones, and, increasingly, wearable devices such as the Microsoft Hololens and Google Glass.
- Try to click the image...





Key values of AR in educational processes

AR technology is robust enough to create virtual space where to live a learning experiences using an AR software application;

AR experiences should complement rather than re-place traditional curriculum material;

Valuable learning occurs during the interaction of AR content as well as in using the AR application itself;

AR provides real benefit for reading comprehension and in understanding spatial data, especially for those with low reading ability

Studies suggest promising findings about the effectiveness of augmented reality-based treatments for the promotion and support of social skills in children and adolescents with special needs (e.g. autism).

Berenguer C, Baixauli I, Gómez S, Andrés MEP, De Stasio S. Exploring the Impact of Augmented Reality in Children and Adolescents with Autism Spectrum Disorder: A Systematic Review. *Int J Environ Res Public Health*. 2020 Aug 24;17(17):6143. doi: 10.3390/ijerph17176143. PMID: 32847074; PMCID: PMC7504463.

(PDF) Augmented Reality in the Classroom. Available from: https://www.researchgate.net/publication/234793015_Augmented_Reality_in_the_Classroom [accessed Nov 10 2020].

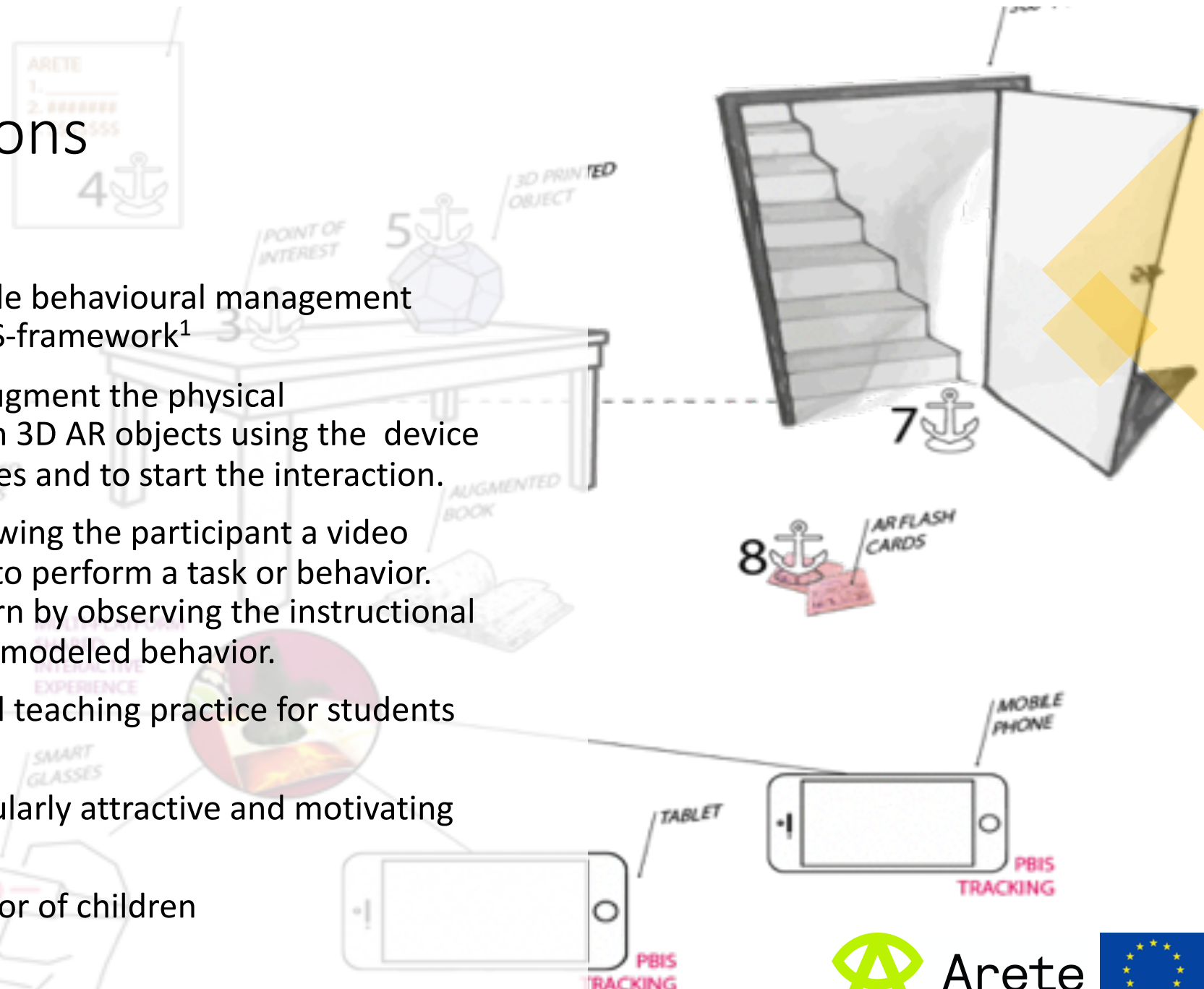
AR and PBIS – Research question in ARETE

- ARETE explores for the first time the use of AR for BPIS.
- *How does AR impact on students' positive behavioral management and self-management skills?*



Research Assumptions

- Visuals are one the most accessible behavioural management strategies to apply within the PBIS-framework¹
- The AR markers allows users to augment the physical environment like a classroom with 3D AR objects using the device camera of tablets or mobile phones and to start the interaction.
- Video Modelling (VM) entails showing the participant a video segment that demonstrates how to perform a task or behavior. The participant is expected to learn by observing the instructional video segment and repeating the modeled behavior.
- VM is an effective evidence-based teaching practice for students with EBD.
- Animation is claimed to be particularly attractive and motivating to young students.
- AR characters affected the behavior of children



Shirai, N., Kondo, L. & Imura, T. Effects of visual information presented by augmented reality on children's behavior. *Sci Rep* 10, 6832 (2020). <https://doi.org/10.1038/s41598-020-63820-z>

¹ Menzies, H.M., Lane, K.L. & Lee, J.M. (2009). Self-Monitoring Strategies for Use in the Classroom: A Promising Practice to Support Productive Behavior for Students with Emotional or Behavioral Disorders. *Beyond Behavior*, 18(2), 27-35



The solution to be implemented

- The Idea is to develop of a set of 3D AR learning objects for a PBIS system of teaching values and expectations.
- A set of 12 scenarios description concerning behavioural routines will be identified and used for the implementation of AR objects in the form of 3D animations to be used in the PBIS-AR app implementation
- A scientific literature scoping review has been made for the construction process of ARETE PBIS behavioural expectation matrix
- A reduction of PBIS matrix has been applied for conducting the research team to a definition of a first set of Expected Behaviour(s) and/or Procedures/Routines useful to the implementation of the 12 scenarios
- An AR Alien will be used as character to animate the expected and unexpected behavioural routines to be overlapped to the real setting.

To introduce the Augmented Reality in a Behavioural Lesson



Prompt

Prompting and/or pre-correcting of the expected behavior.

Teach/Model

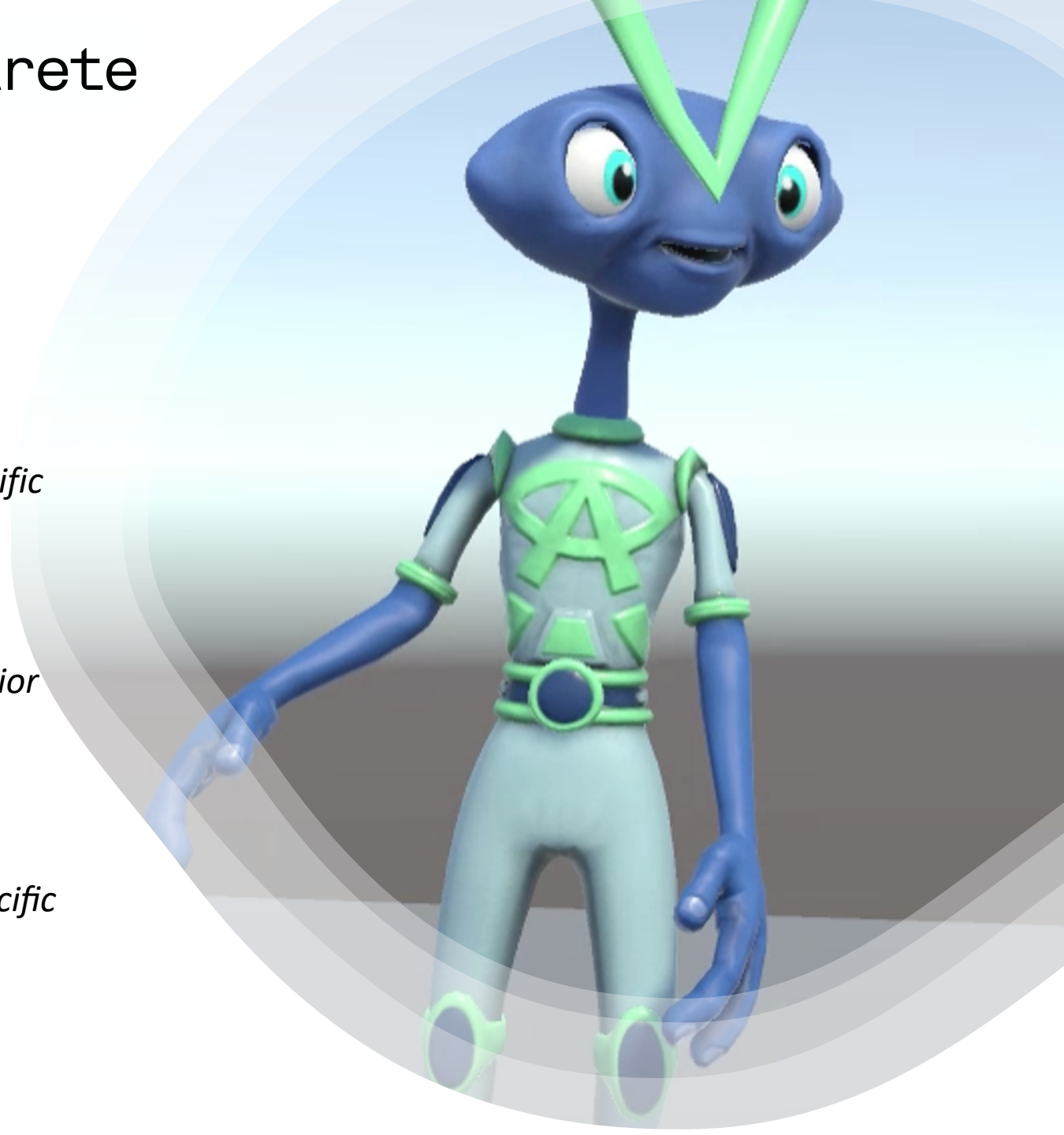
Observe student performance & give positive, specific feedback to students


Practice

Give students opportunities to role play the behavior across all relevant settings

Reinforce

Observe student performance & give positive, specific feedback to students





Walk calmly Routine at
entrance/exit or corridors
(development preview)

Final considerations

- Nowadays, it's possible to observe an increasing number of emerging digital tools designed not only to detect and predict but also to shape and modify behaviour; scientifically watchful approaches in data collection and analysis.
- Emerging Technologies such as evidence-based tools, augmented reality, learning analytics are levers able to address a behaviour change that opens access to new reinforcers and new environments, occasions new behaviours, and it impacts in the development of increasingly effective interventions.
- AR & PBIS, apparently two independent domains, can be mutually enriching and to greatly advance the value of both.
- The emergence of these new technologies can also be a kind of "cusp" for behaviour analysis and modification, providing opportunities for unplanned access, new teaching and learning experiences, measurement and analysis of a world of real-time behaviour, opening the door to far-reaching consequences for the individual and society (Twyman, 2011).



Thank You!

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Project websites: <https://www.behaveproject.eu/>
<https://www.baseproj.eu>
<https://www.areteproject.eu>