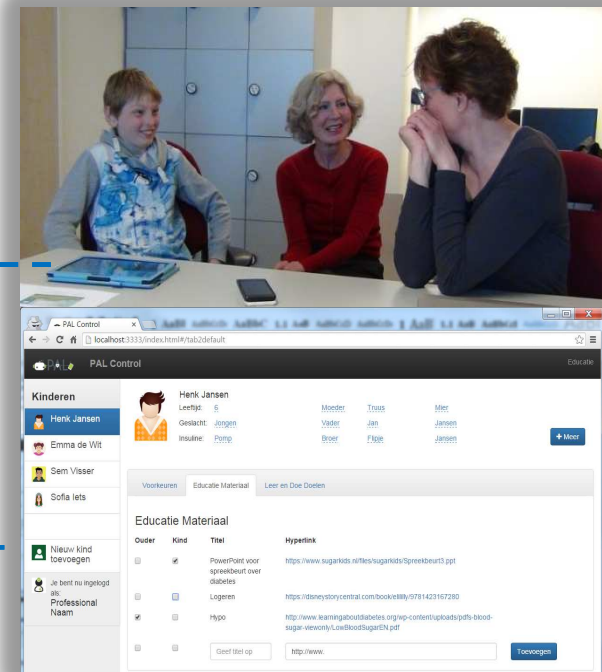


Robots and Agents that Care: Social, Cognitive & Affective Support



Mark Neerincx

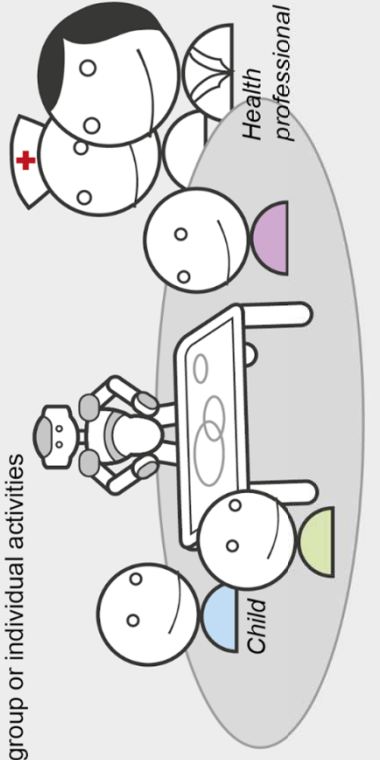
Gert Jan van der Burg



PERSONAL ASSISTANT FOR HEALTHY LIFESTYLE

PAL Robot and Health Apps

for group or individual activities



TNO innovation
for life



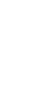
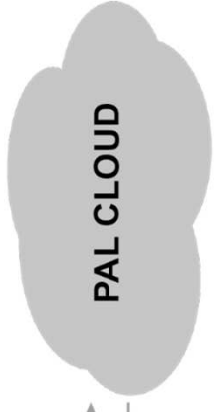
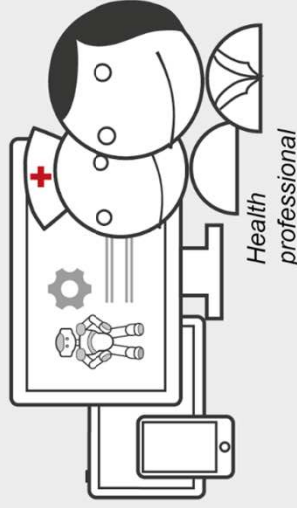
At hospital



At camp

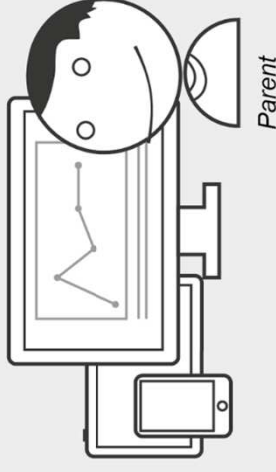
PAL Authoring & Control

for selecting and tailoring of Robot (Avatar)'s behaviours and Apps



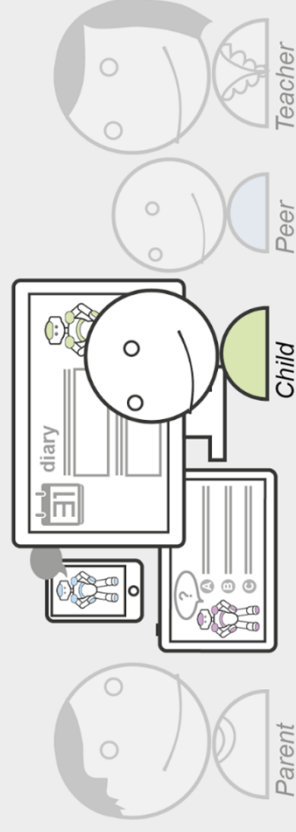
PAL Monitor & Inform

for being aware and understanding of child's condition and behavior



PAL Robot Avatar and mHealth Apps

for individual (mobile) activities

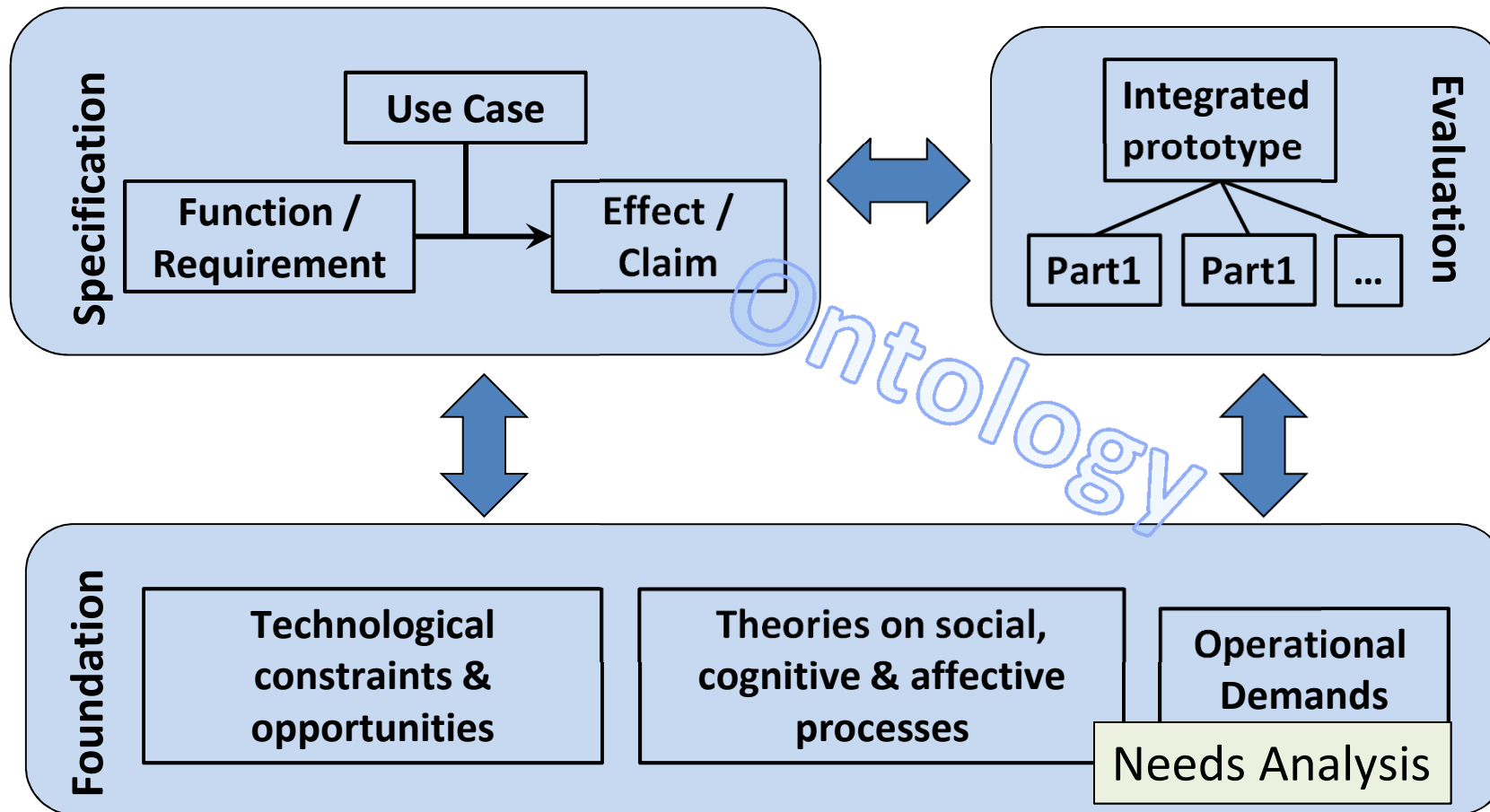


At home

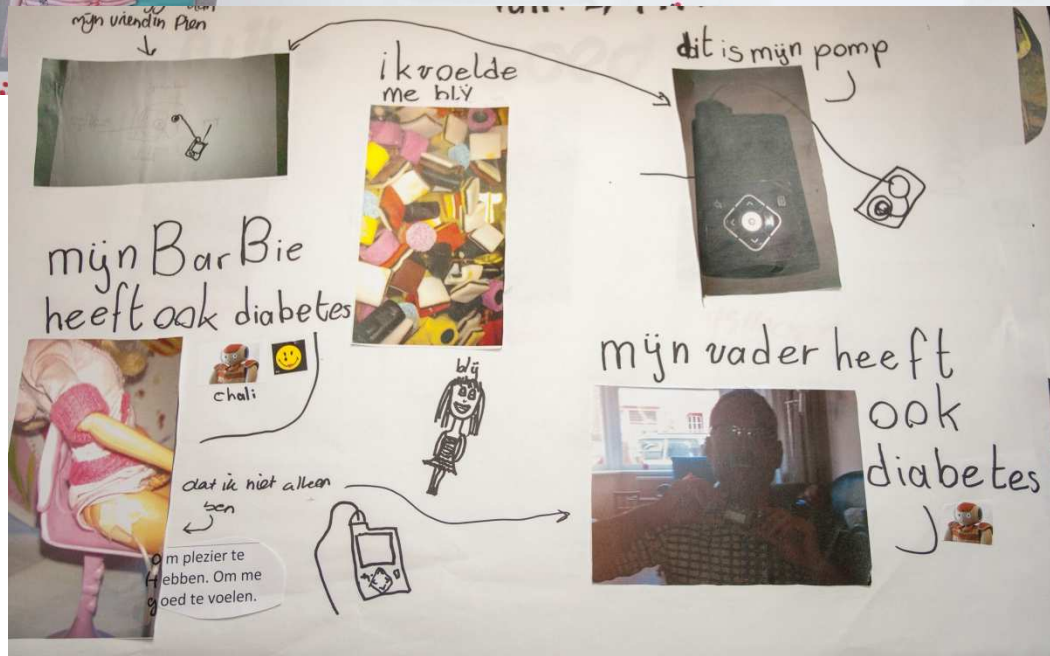


Elsewhere
(e.g. school,
sports club)

Situated Cognitive Engineering



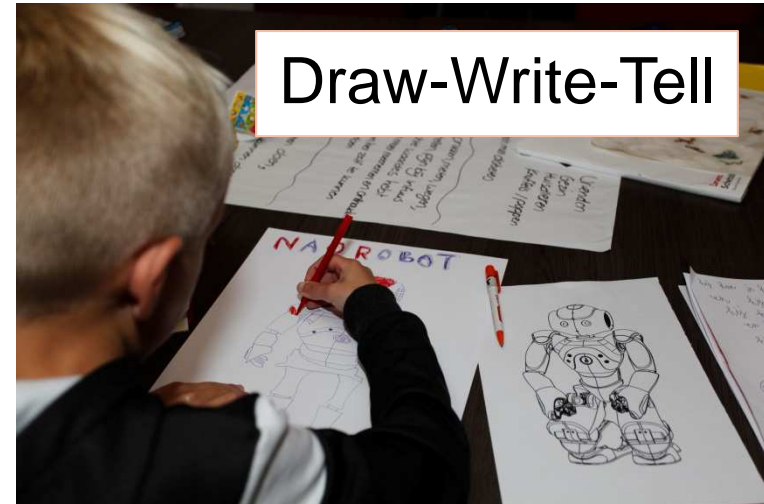
Situated Needs Analysis: Photo Elicitation



Situated Needs Analysis: Creative Methods



Image
Theatre



Draw-Write-Tell



Story-Telling

Situated Needs Analysis: Outcomes

Photo-elicitation



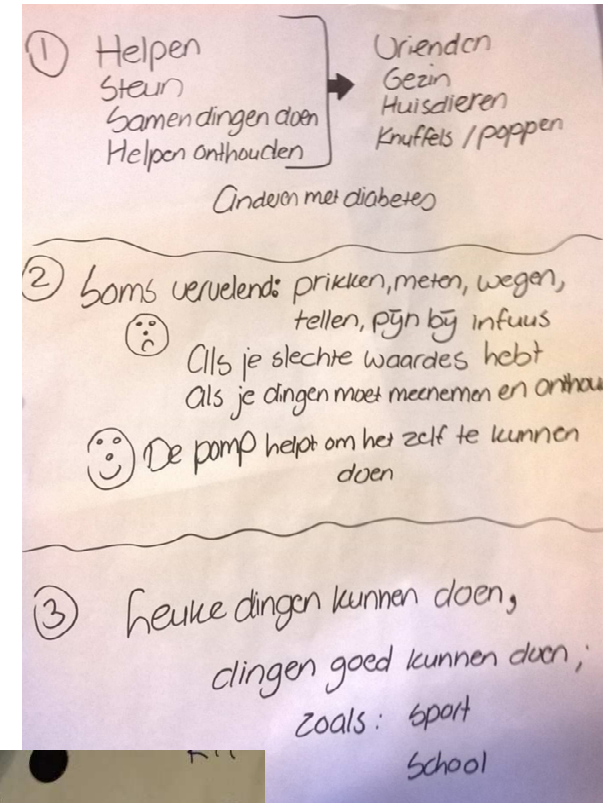
- Positive: Support of friends
- Negative: Diabetes regime
- Have fun activities like others
- ...

Creative methods

- Draw-write-tell
- Image theatre
- Story-telling



- › Calculation Support
- › Help for Measuring
- › Friendship
- › Play-fellow
- › Support
- › ...



Comparing Italian and Dutch Children's Experiences with the Robot at the Camps

Italian camp:

- learning to live with diabetes & needs analysis
- 34 children, age 10-14

Dutch camp:

- sharing leisure experiences & needs analysis
- 21 children, age 8-11

Child-robot activities (quiz & sorting game):

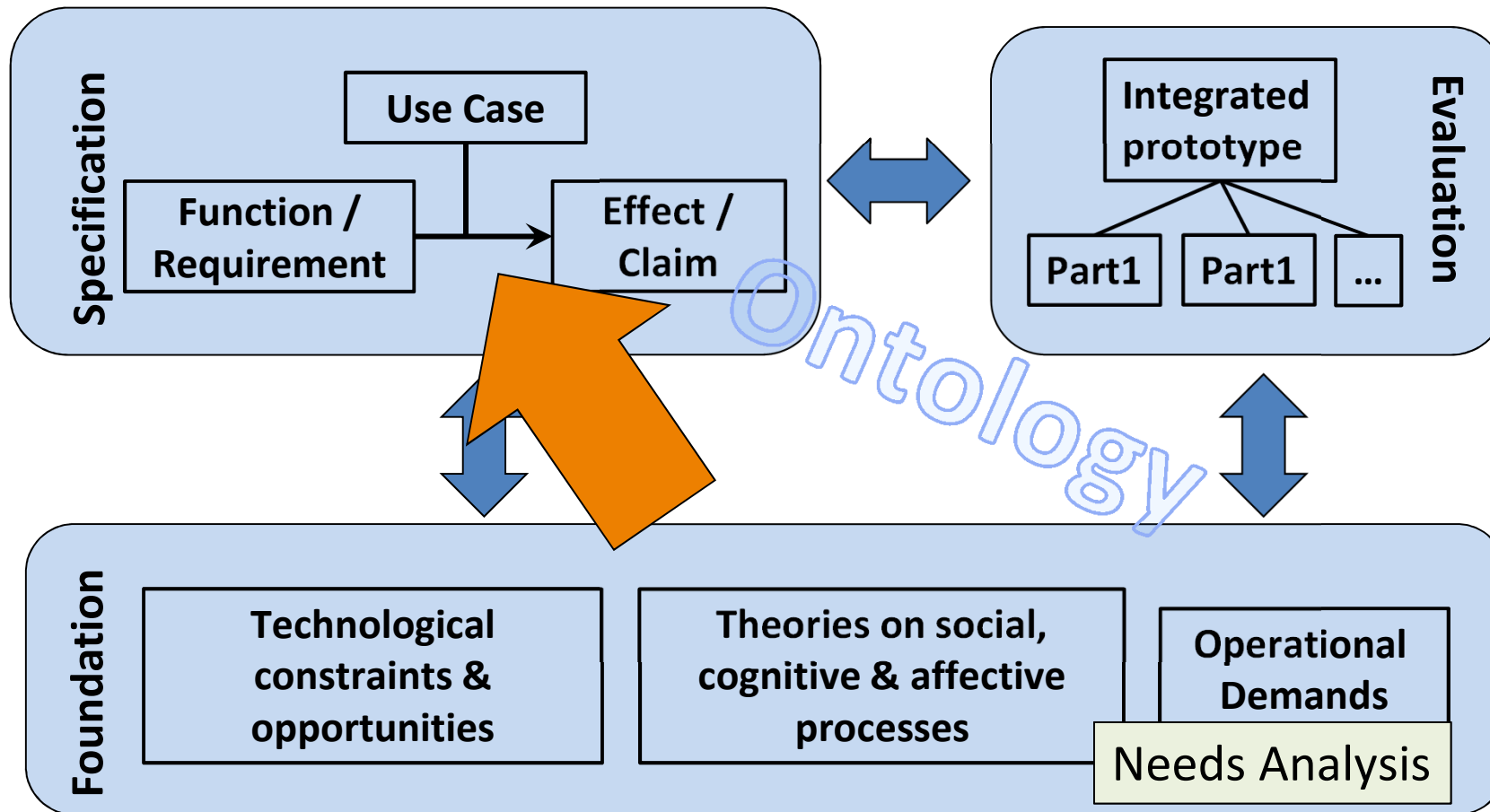
- Sentiment Analyses on child's textual answers)
- Observations of speech, gestures and posture

Results

- Children were lenient & positive
- Emotional expressions differ per activity
- Italians more expressive, less eye contact
- User requirements for culture-aware personalization



Situated Cognitive Engineering



Deriving Design Specifications

ANDREA

PATIENT DIABETES TYPE 1 - BEGINNER



"I WOULD LIKE TO BE ABLE TO PUT
THEORETICAL NOTIONS"

MUST DO
LEARN THE PRACTICAL BASIS OF THE THERAPY
MANAGEMENT

DELEGATE
DELEGATE TASKS TO PARENTS/GRANDPARENTS

- Diabetes camps
- Focus groups
- Interviews
- Stakeholder analysis



ABOUT

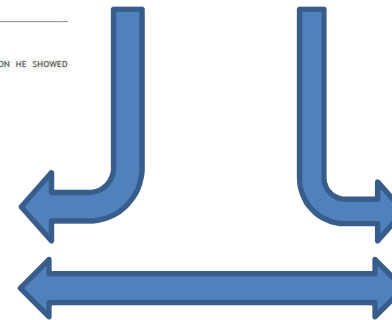
AGE, GENDER: 9 YEARS OLD / MALE
ACTIVITY: STUDENT
NATIONALITY: ITALIAN

USER STORY

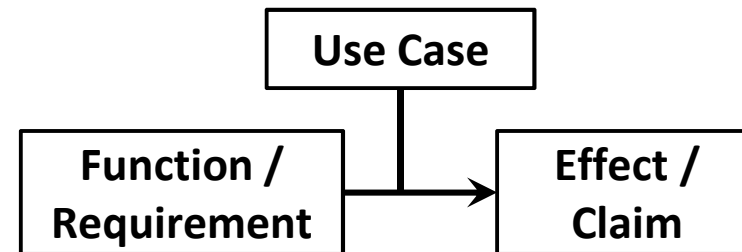
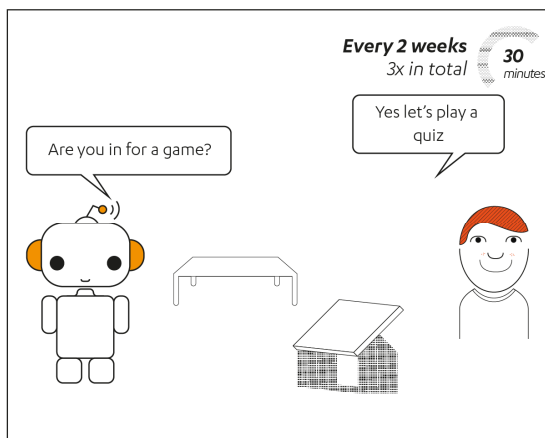
DIAGNOSIS:
ANDREA DIDN'T HAVE A TRAUMATIC ONSET, FEW DAYS BEFORE HIS HOSPITALIZATION HE SHOWED SYMPTOMS LIKE LOSS OF WEIGHT AND THE INCREASING OF THIRST AND URINATION.

DAILY LIFE:
ANDREA ATTENDS THE PRIMARY SCHOOL (CLASS IV GRADE) WITH GOOD RESULTS.

- Personas
- Journey maps
- Storyboards



- Use cases
- Values
- Requirements
- Claims



Involving Parents and Caregivers as PAL-Users

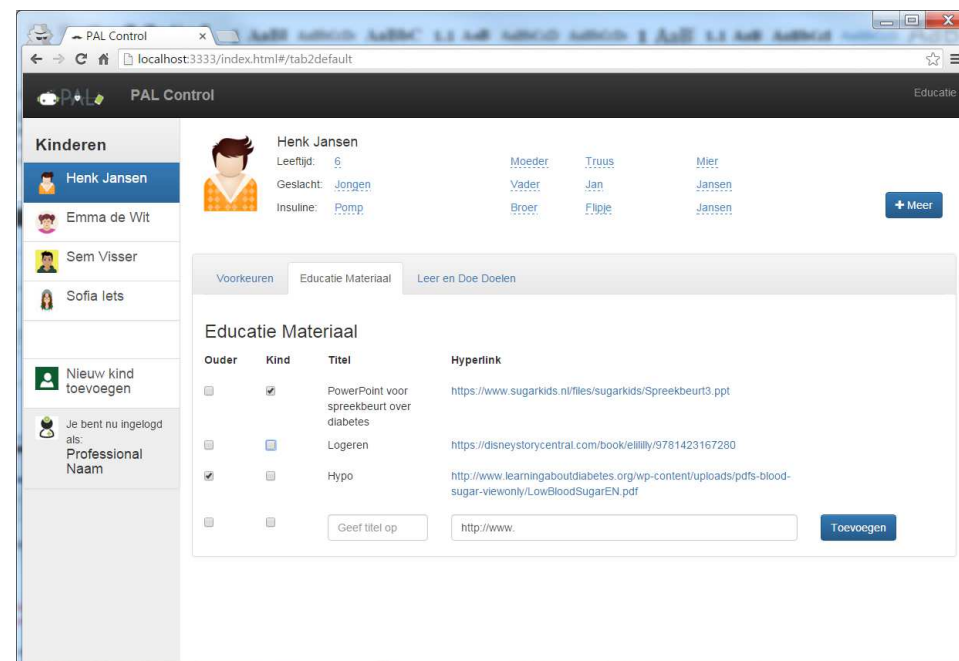
“Blended Care”

- Caregivers are present during child-robot activities
- Policies and agreements on
 - Goals
 - Information sharing (privacy)



PAL Control & Monitor

- Child profile
- Goal setting
- Authoring
- Monitoring
- ...



Kinderen

- Henk Jansen
- Emma de Wit
- Sem Visser
- Sofia Iets

Nieuw kind toevoegen

Je bent nu ingelogd als Professional Naam

Henk Jansen
 Leeftijd: 6
 Geslacht: Jongen
 Insuline: Pomp

Moeder: Truus
 Vader: Jan
 Broer: Flipje
 Mier Jansen
 + Meer

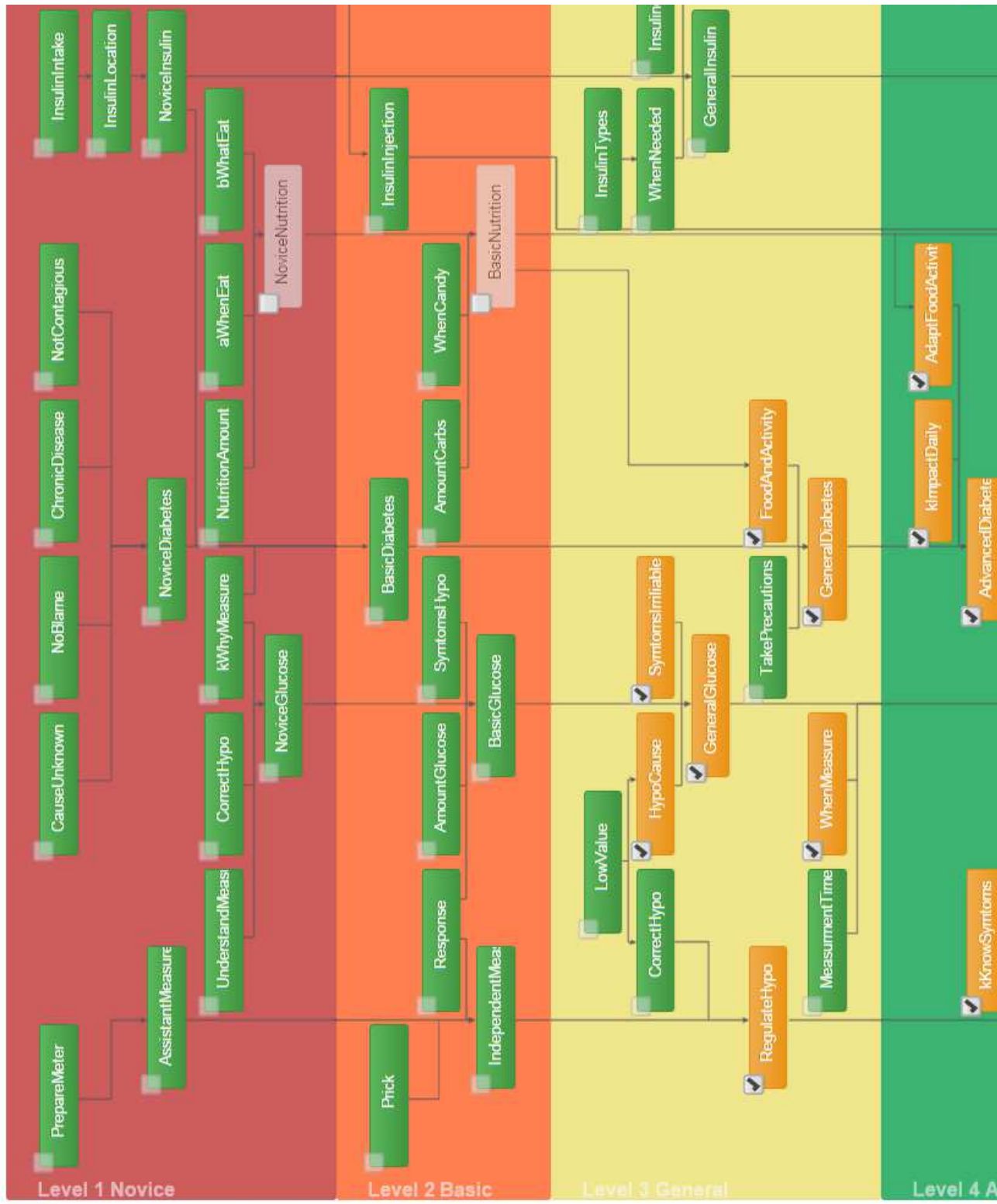
Voorkeuren | **Educatie Materiaal** | Leer en Doe Doelen

Educatie Materiaal

Ouder	Kind	Titel	Hyperlink
<input type="checkbox"/>	<input checked="" type="checkbox"/>	PowerPoint voor spreekbeurt over diabetes	https://www.sugarkids.nl/files/sugarkids/Spreekbeurt3.ppt
<input type="checkbox"/>	<input type="checkbox"/>	Logeren	https://disneystorycentraal.com/book/eiililly/9781423167280
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Hypo	http://www.learningaboutdiabetes.org/wp-content/uploads/pdfs-blood-sugar-viewonly/LowBloodSugarEN.pdf
<input type="checkbox"/>	<input type="checkbox"/>	Geef titel op	<input type="text" value="http://www."/>

Kinderen

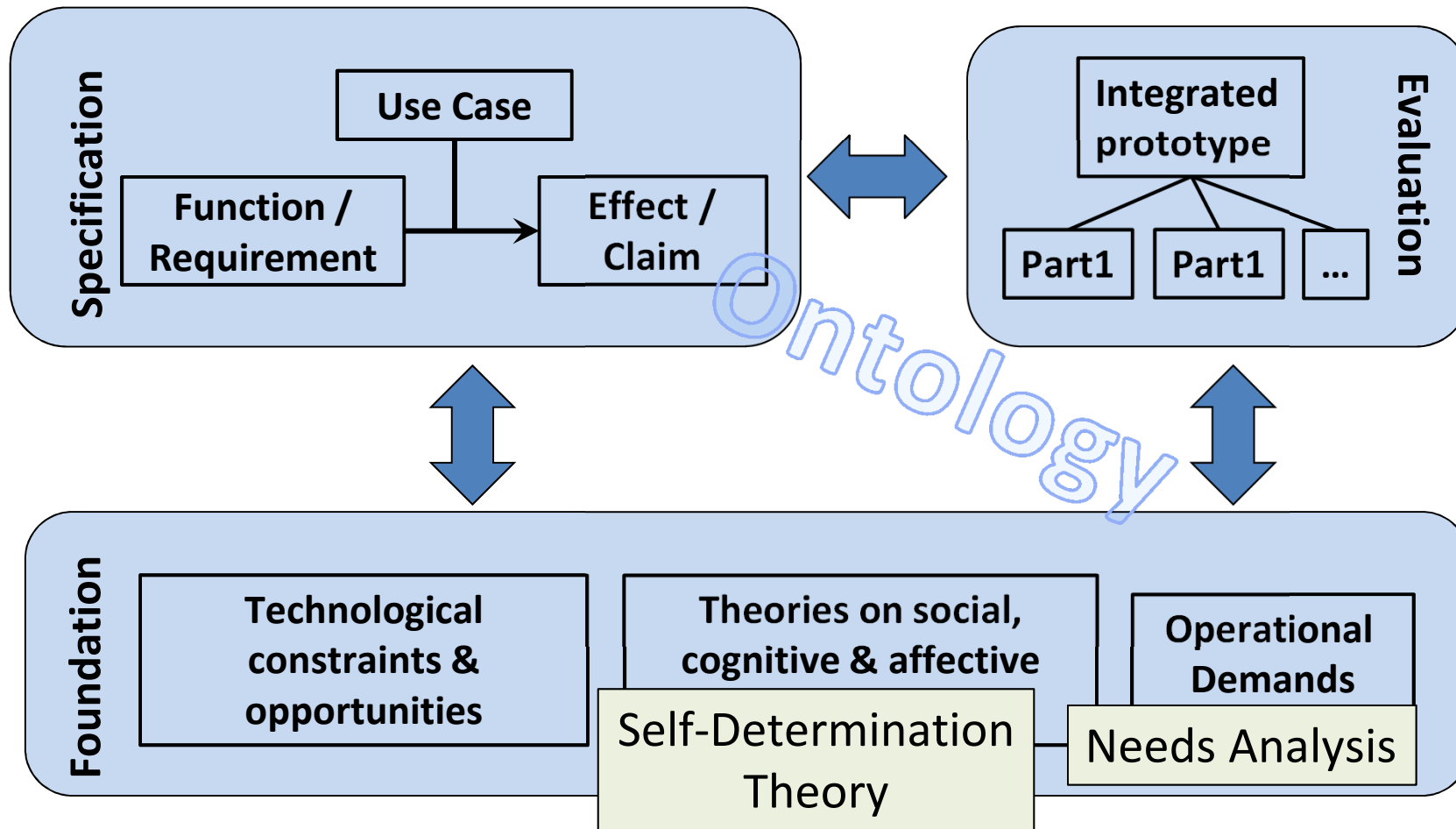
Leer en Doe Doelen



Nieuw kind toevoegen

Je bent nu ingelogd als: **na na**
Uitloggen

Situated Cognitive Engineering



MyPAL

Kalender

Doelen

Galerij

Admin

Uitleg

Activiteit toevoegen

Meting toevoegen

Kalender

< Vandaag >



Sport: Hockey (19:00)



Vertel eens

Partijtje spelen was leuk! Maar het was ook erg koud.

Gevoel



Foto



Robin



Ga jij wel eens boodschappen doen? Ik mag altijd in het wagentje zitten.

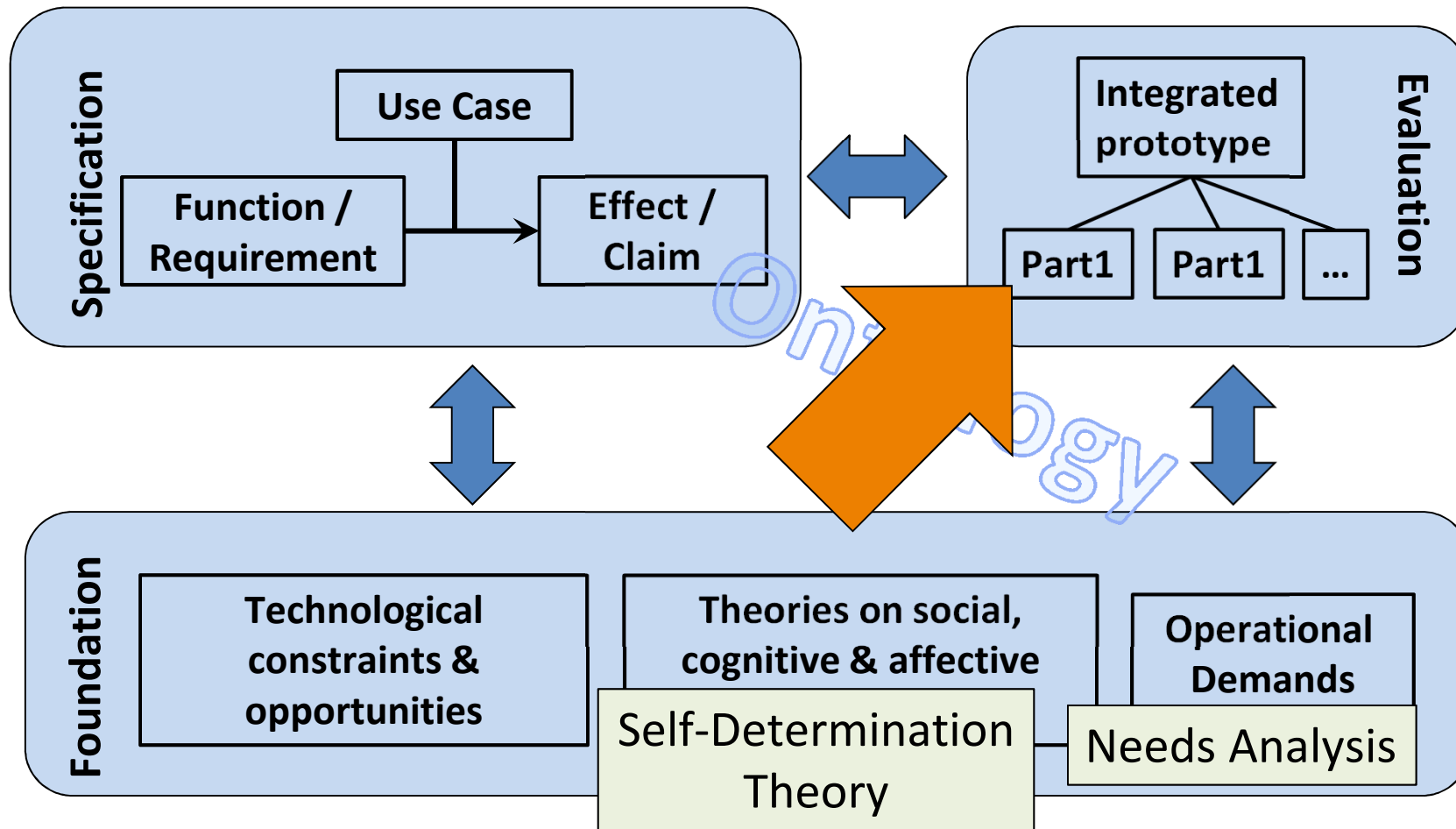


High-Level Requirements



	Autonomy	Competence	Relatedness
Timeline	create (timeline related) goals	edit activities (e.g. school, sport, meal) and measurements	add photo's, mood and thoughts
Avatar	guides the children through the selection process	praises adherence and progress	discusses activities, matches child mood, shares stories & photos of itself

Situated Cognitive Engineering



Formative Cooperative Evaluation



MyPal (timeline)

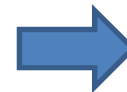


Recommendations for

- Functions
- Ease of Use
- Attractiveness
- ...



PAL Avatar



Recommendations for

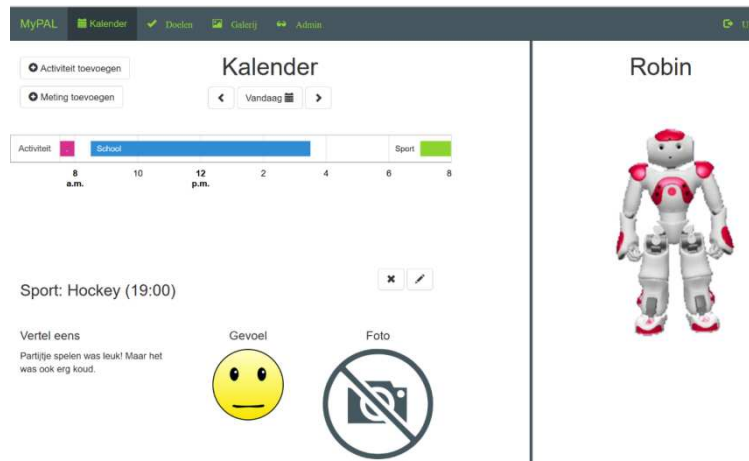
- Personalization
- Behaviours
- Appearances
- ...

Formative Usage Evaluation

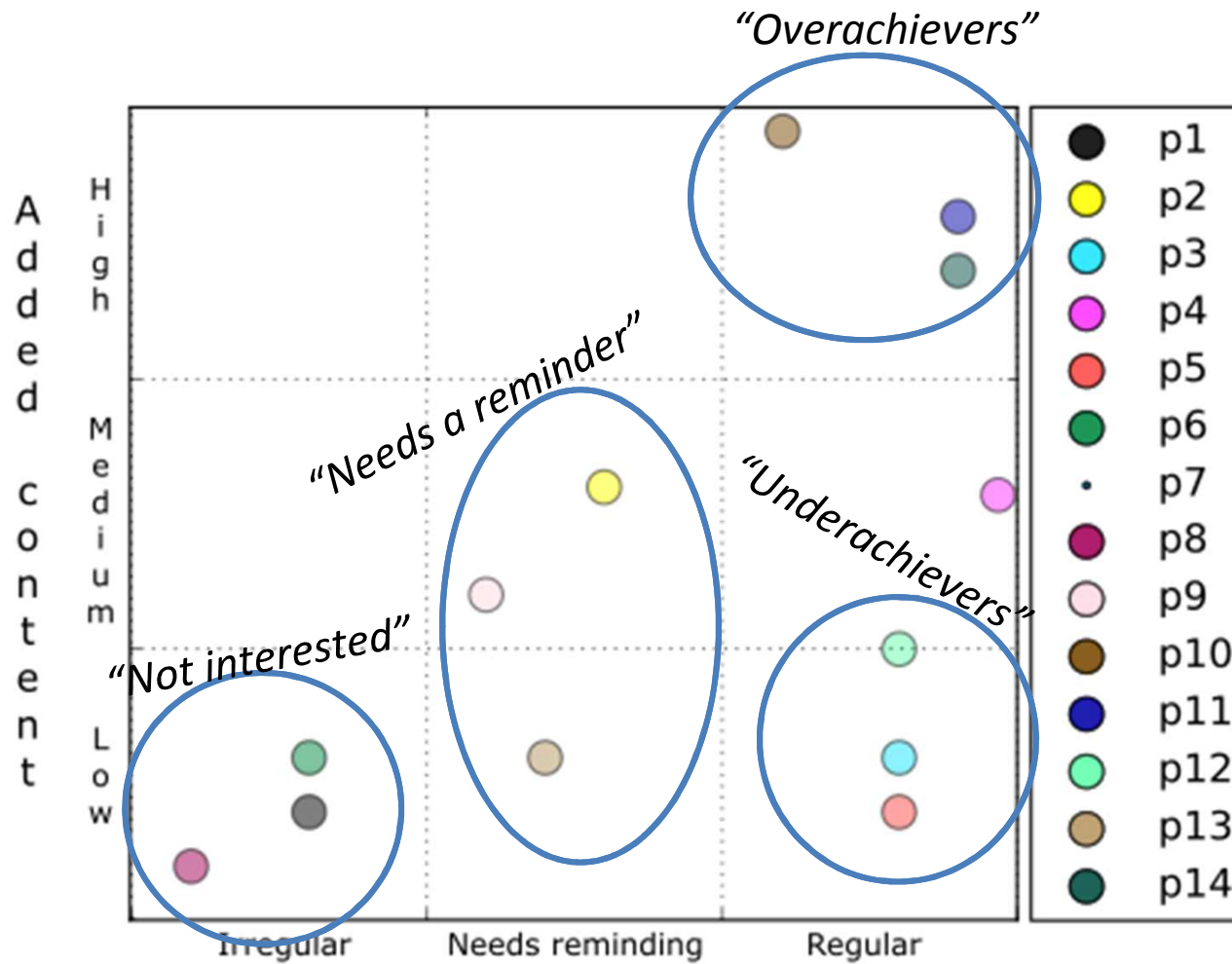
13 participants (age: 7-12; 4 girls, 9 boys)
Patients at Ziekenhuis Gelderse Vallei

Three parts:

- Introduction session at hospital
- Two-week myPAL use at home
- Evaluation session at hospital

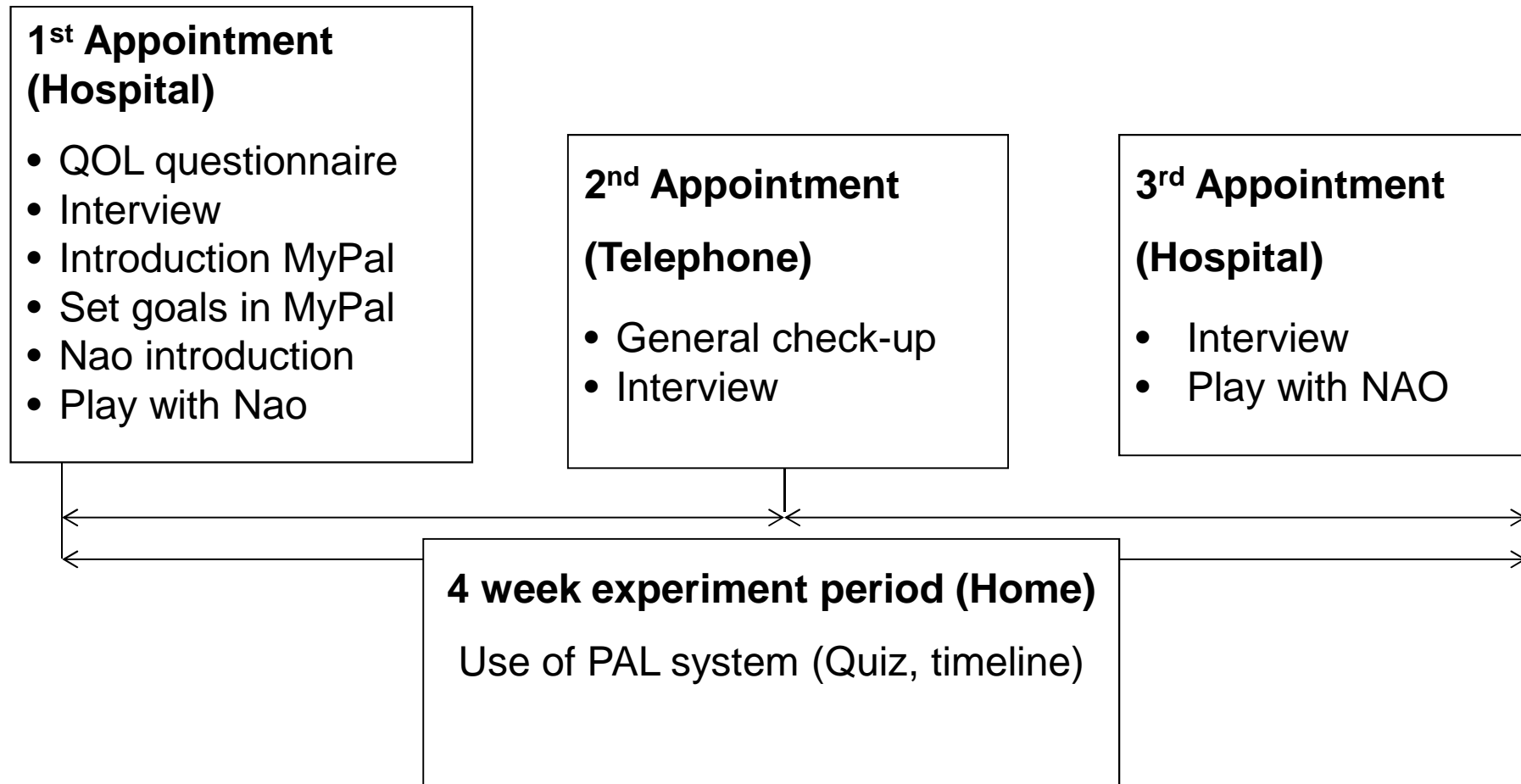


Outcomes

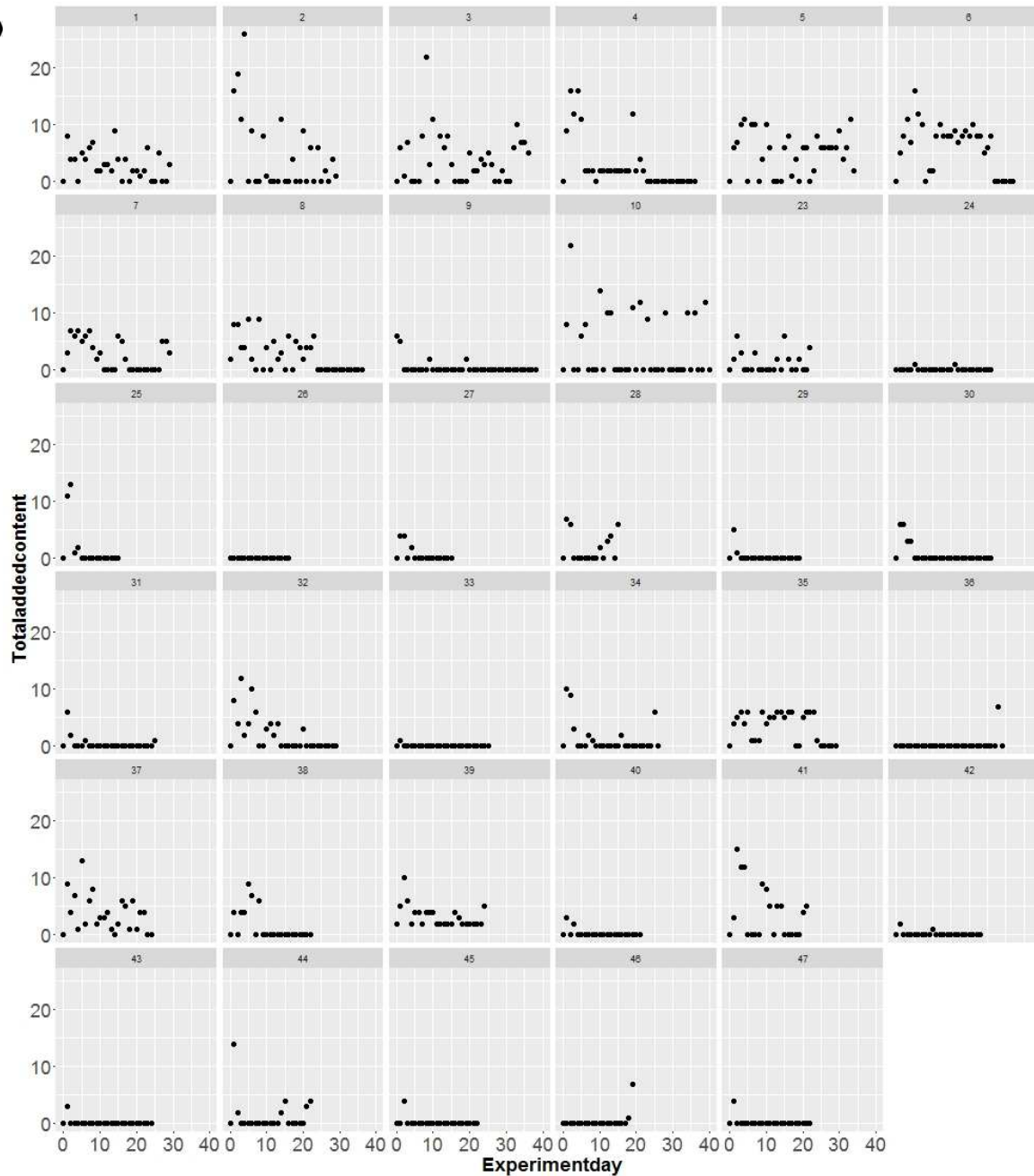


Experiment in Italy and Netherlands

Design and procedure

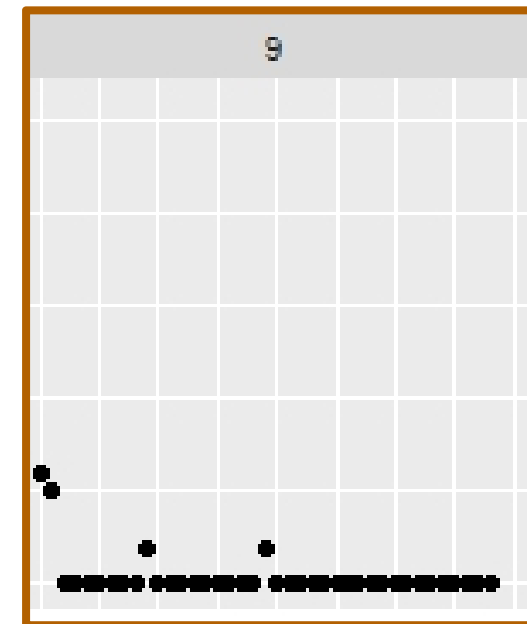
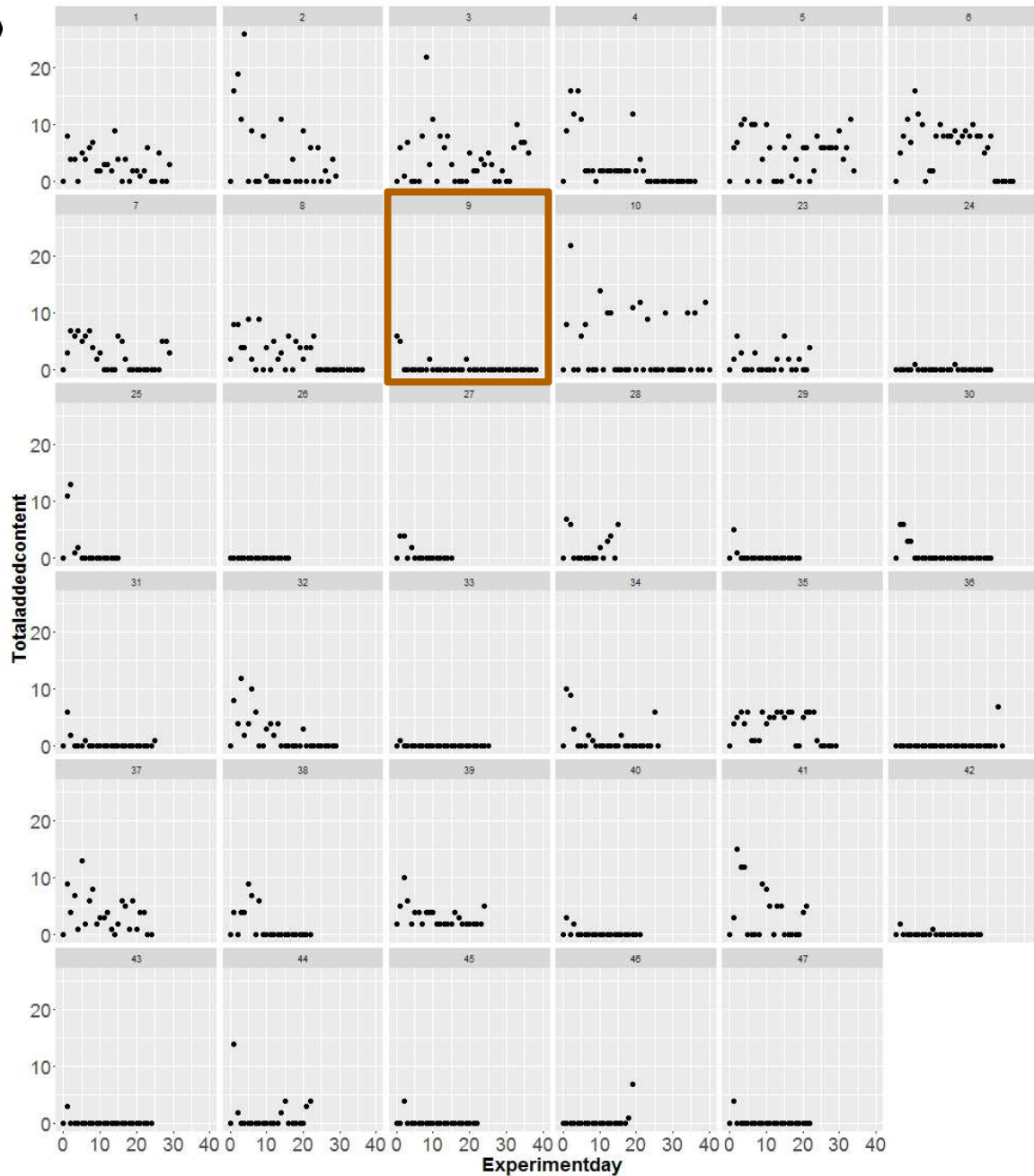


3 trends



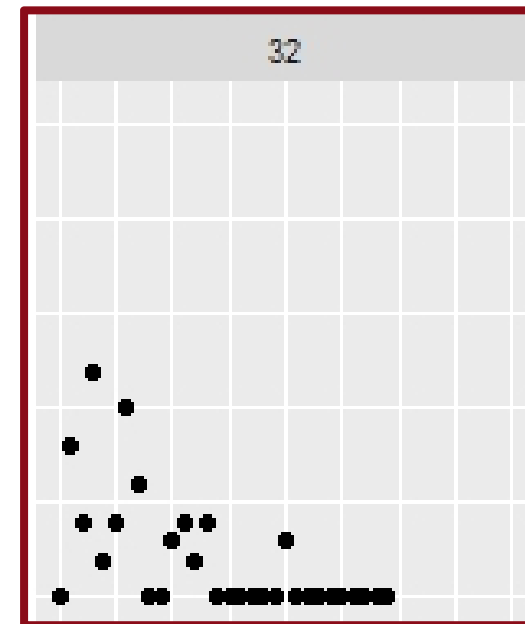
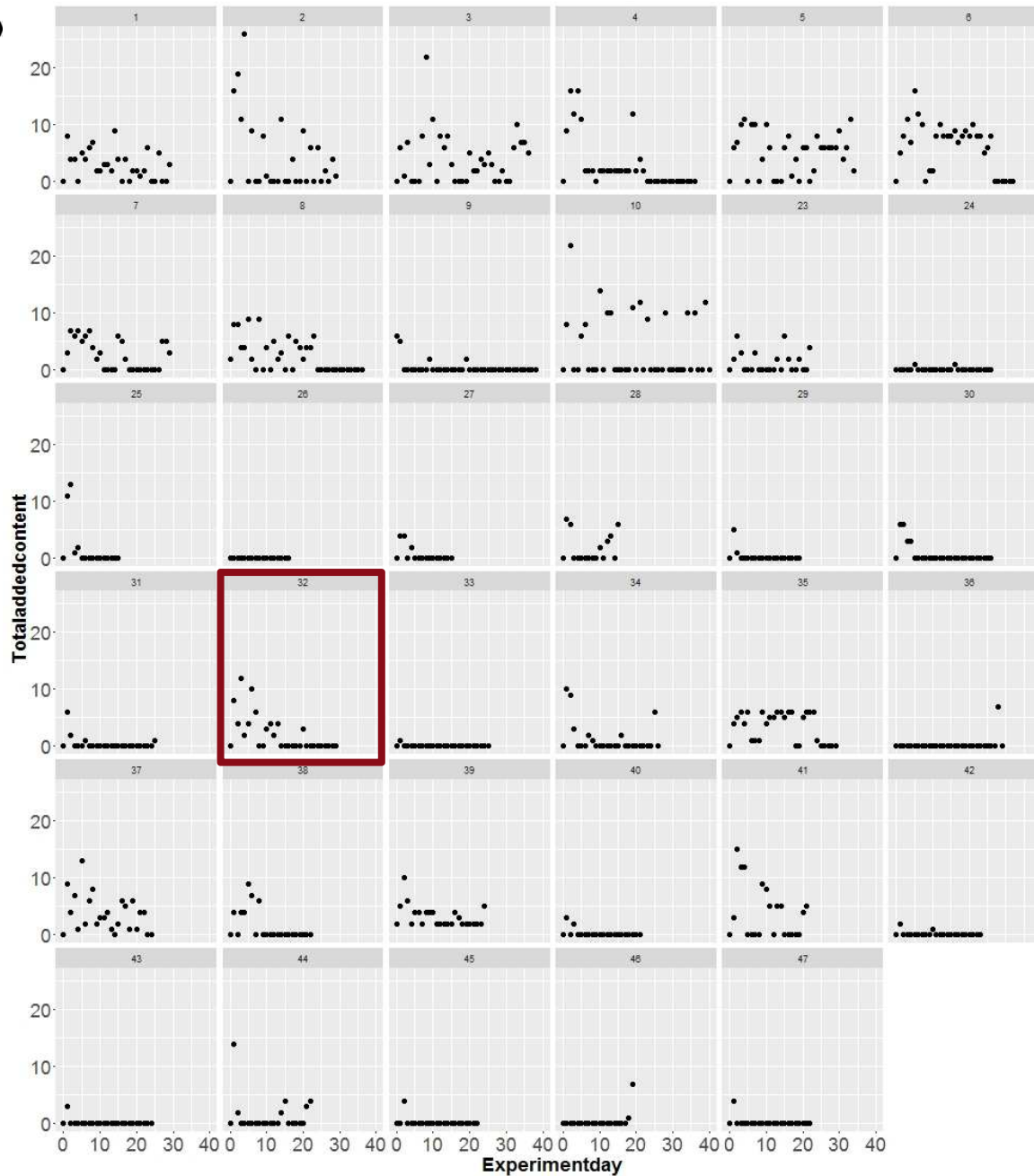
3 trends

- Minimal use during whole period



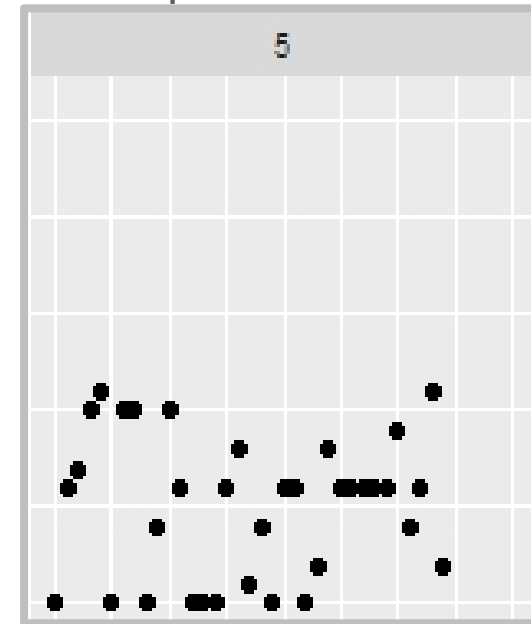
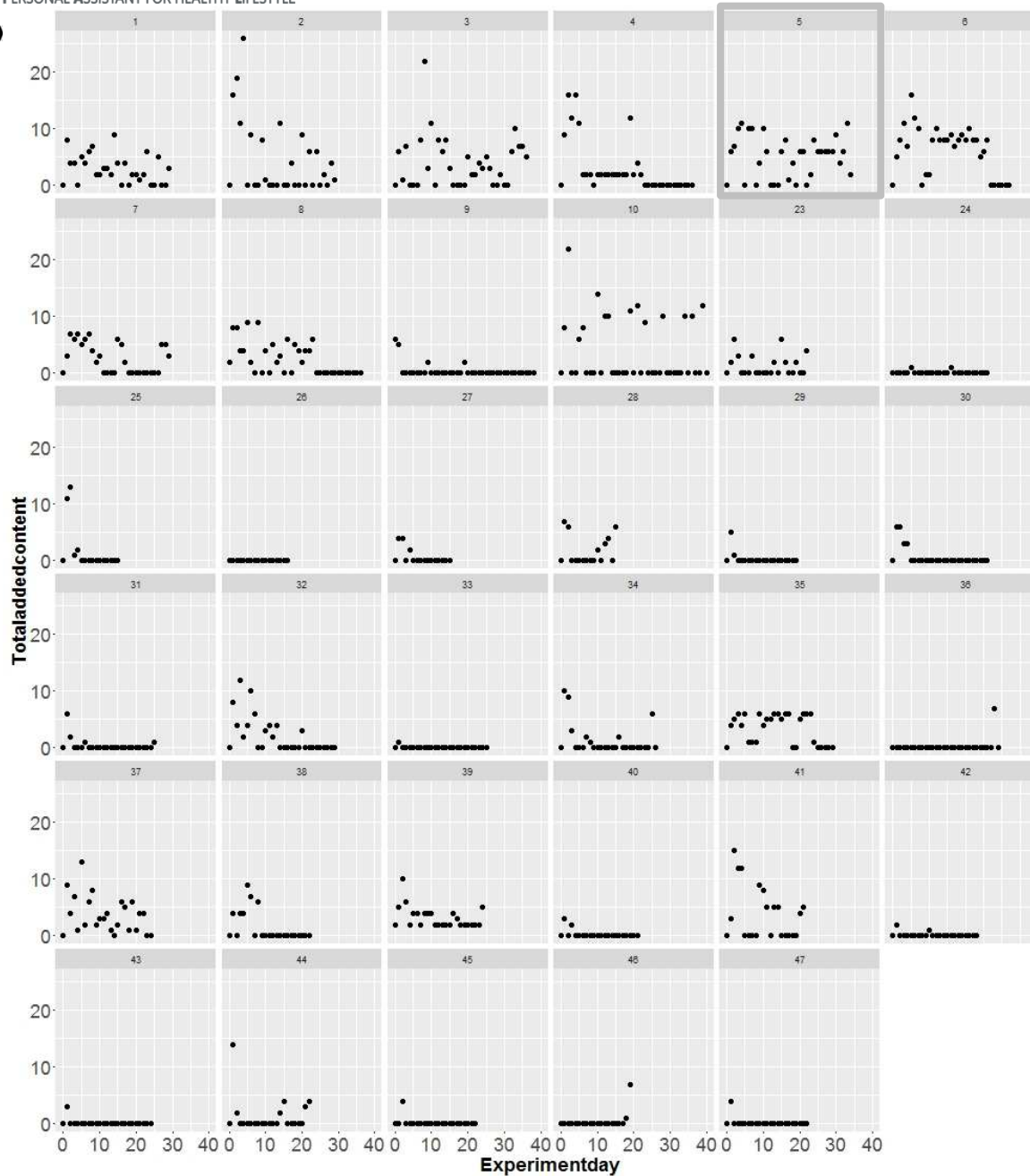
3 trends

- Minimal use during whole period
- Initial use with decrease over time

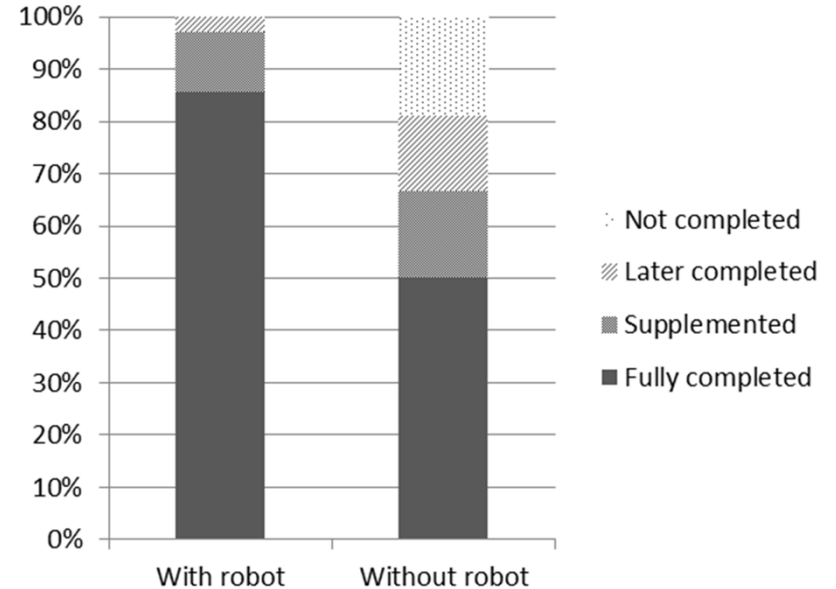
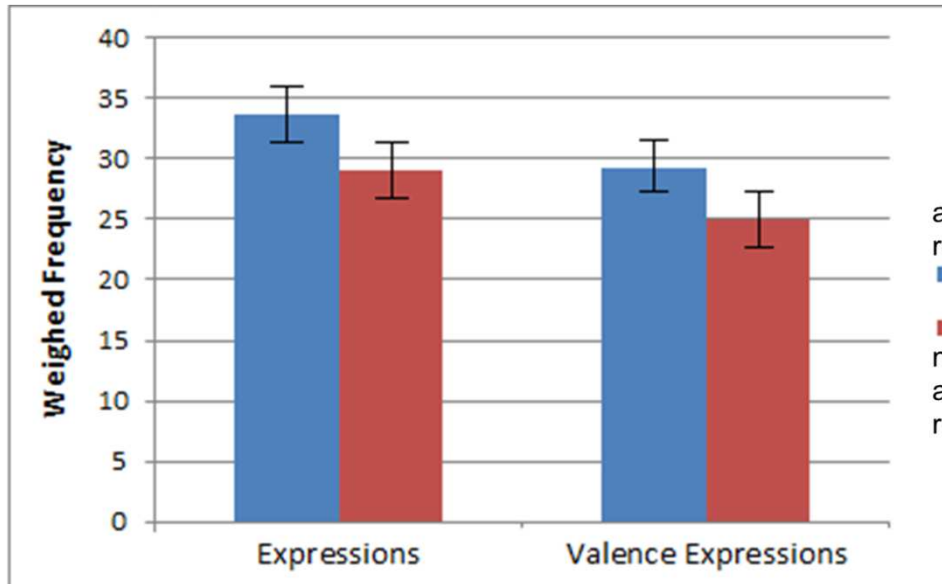
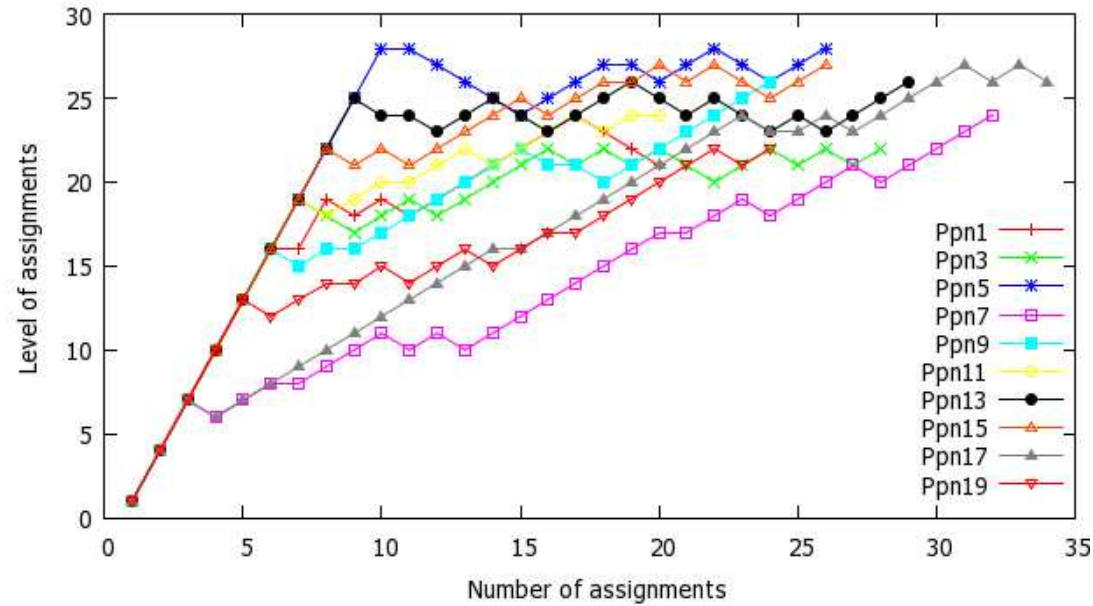


3 trends

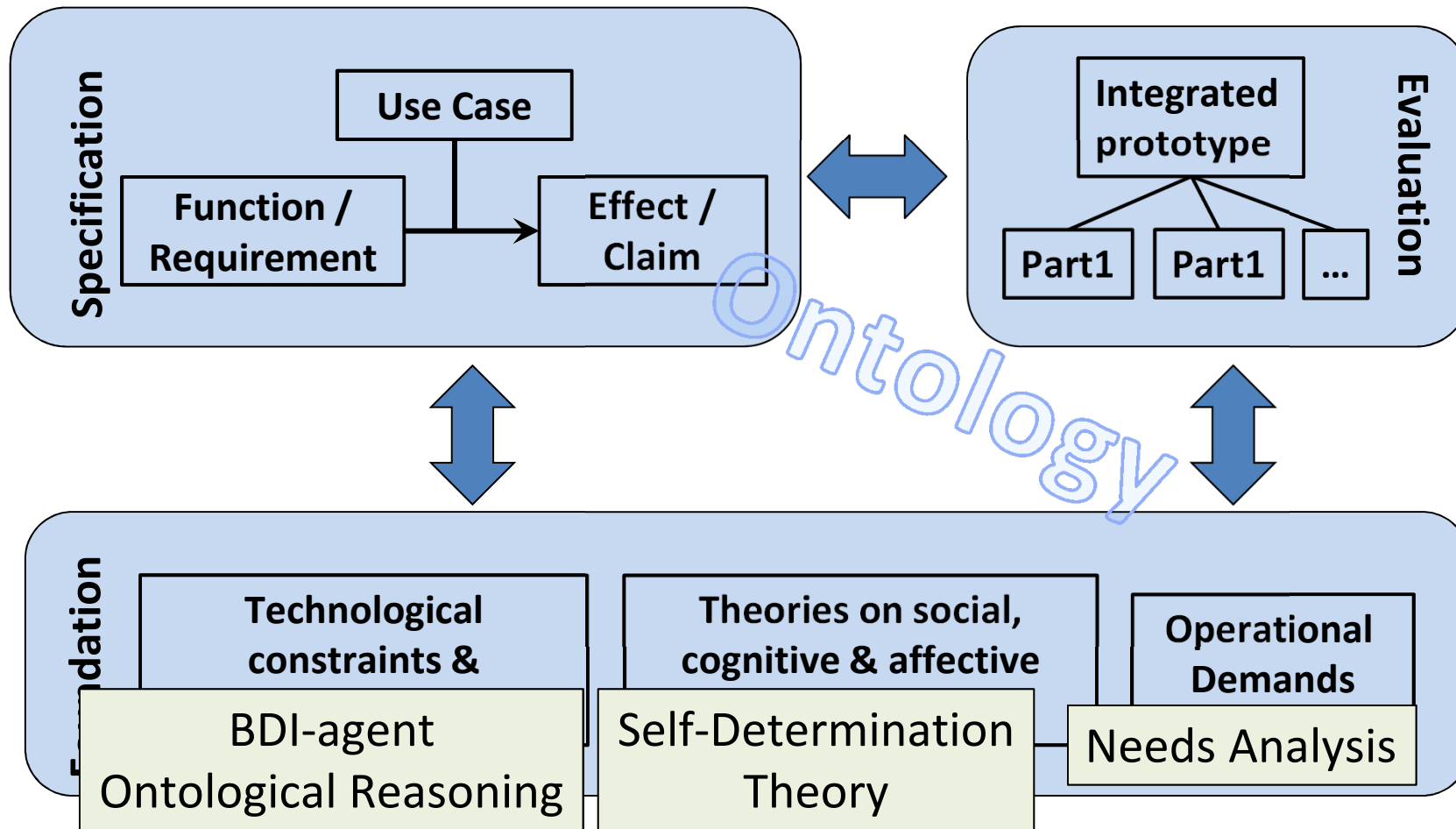
- Minimal use during whole period
- Initial use with decrease over time
- Consistent use during whole period



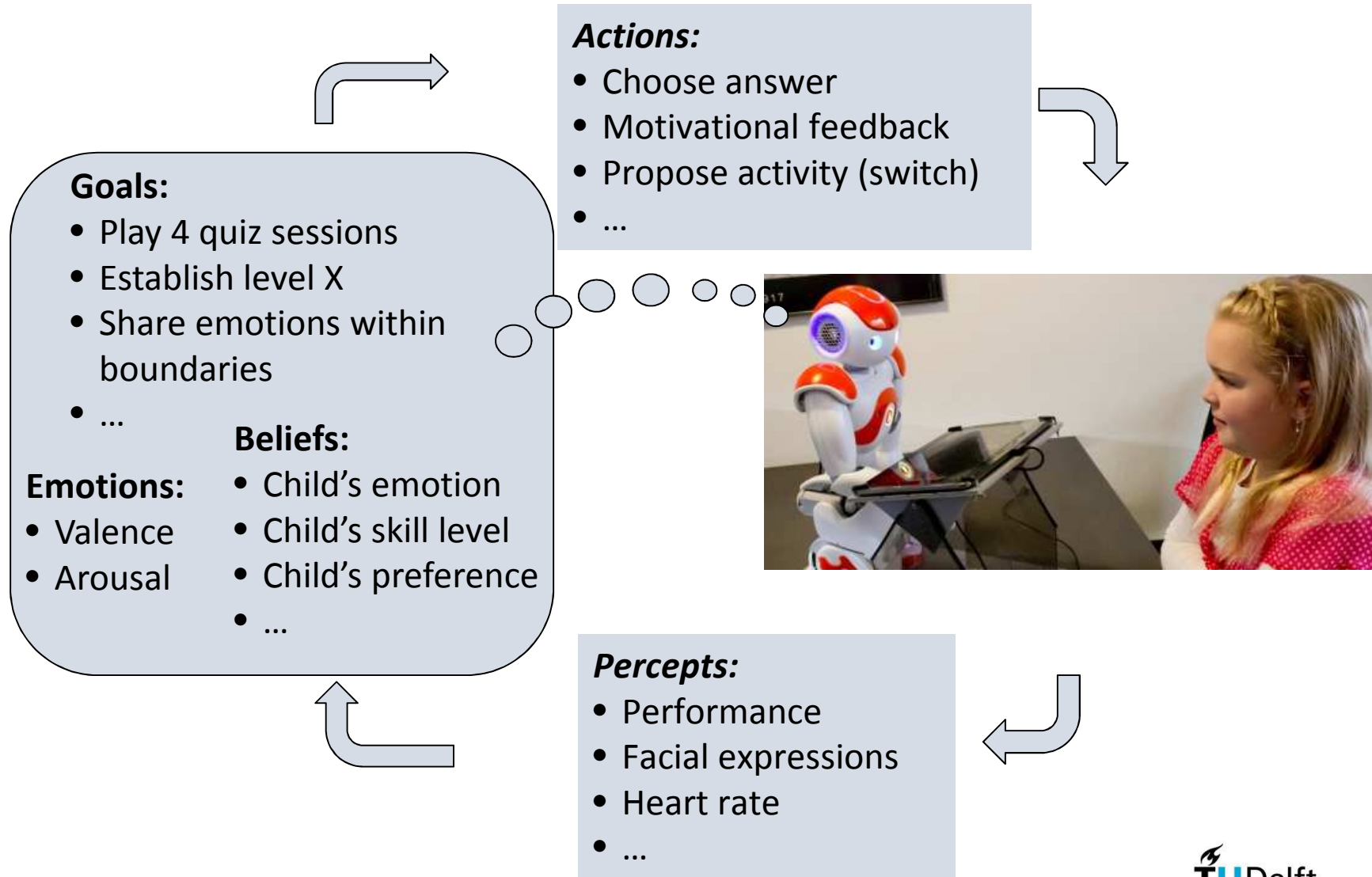
Performance on mathematical assignments with adaptive robot

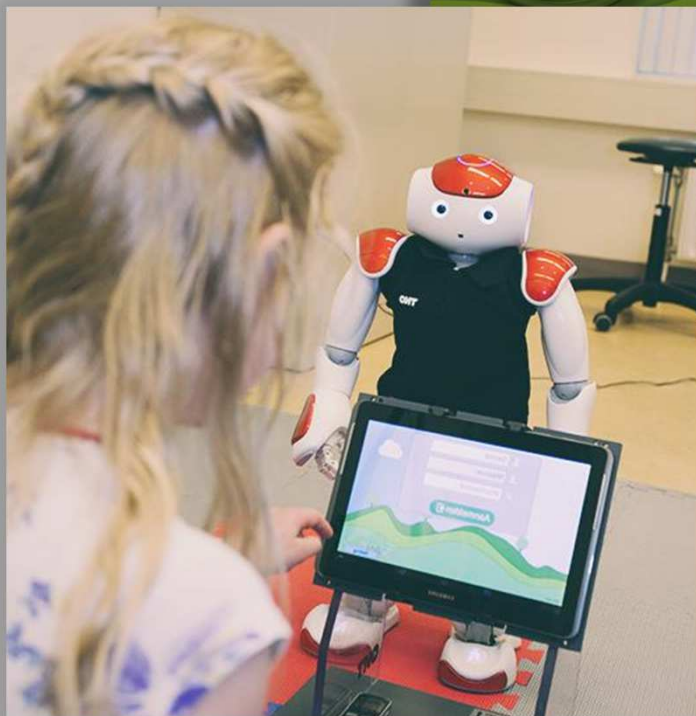


Situated Cognitive Engineering



Child-Agent Interaction





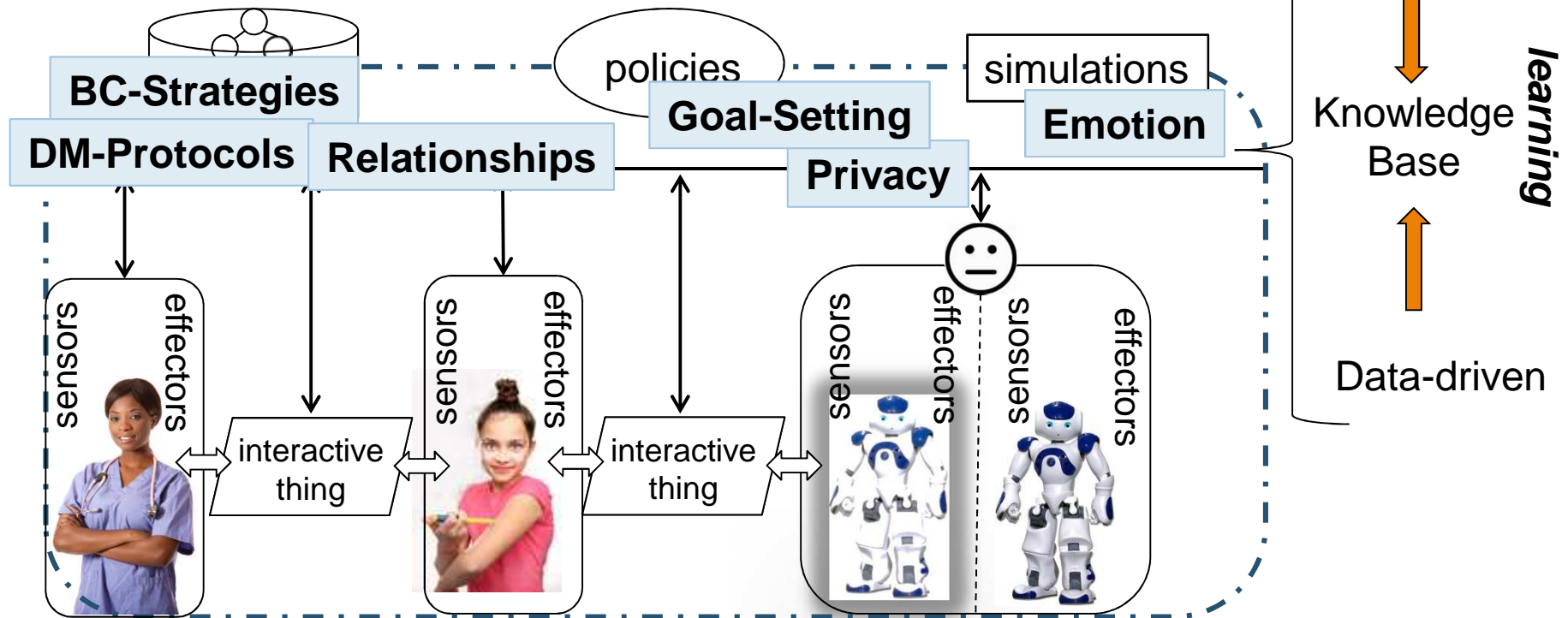
“No machines with self-sustaining long-term goals and intent have been developed, nor are they likely to be developed in the near future”

Stone et al. (Sept 2016). Artificial Intelligence and Life in 2030. One Hundred Year Study on Artificial Intelligence: Report of the 2015-2016 Study Panel, Stanford University, Stanford, CA

Human Values

Situated

Evolutionary



Thank you for your attention



Co-funded by the Horizon 2020 Framework Programme of the European Union under grant agreement no 643783

Partners of the project

TNO innovation
for life

 **Diabetesvereniging
Nederland**



 **meander**
MEDISCH CENTRUM

Ziekenhuis
Gelderse
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SOSTegno



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