

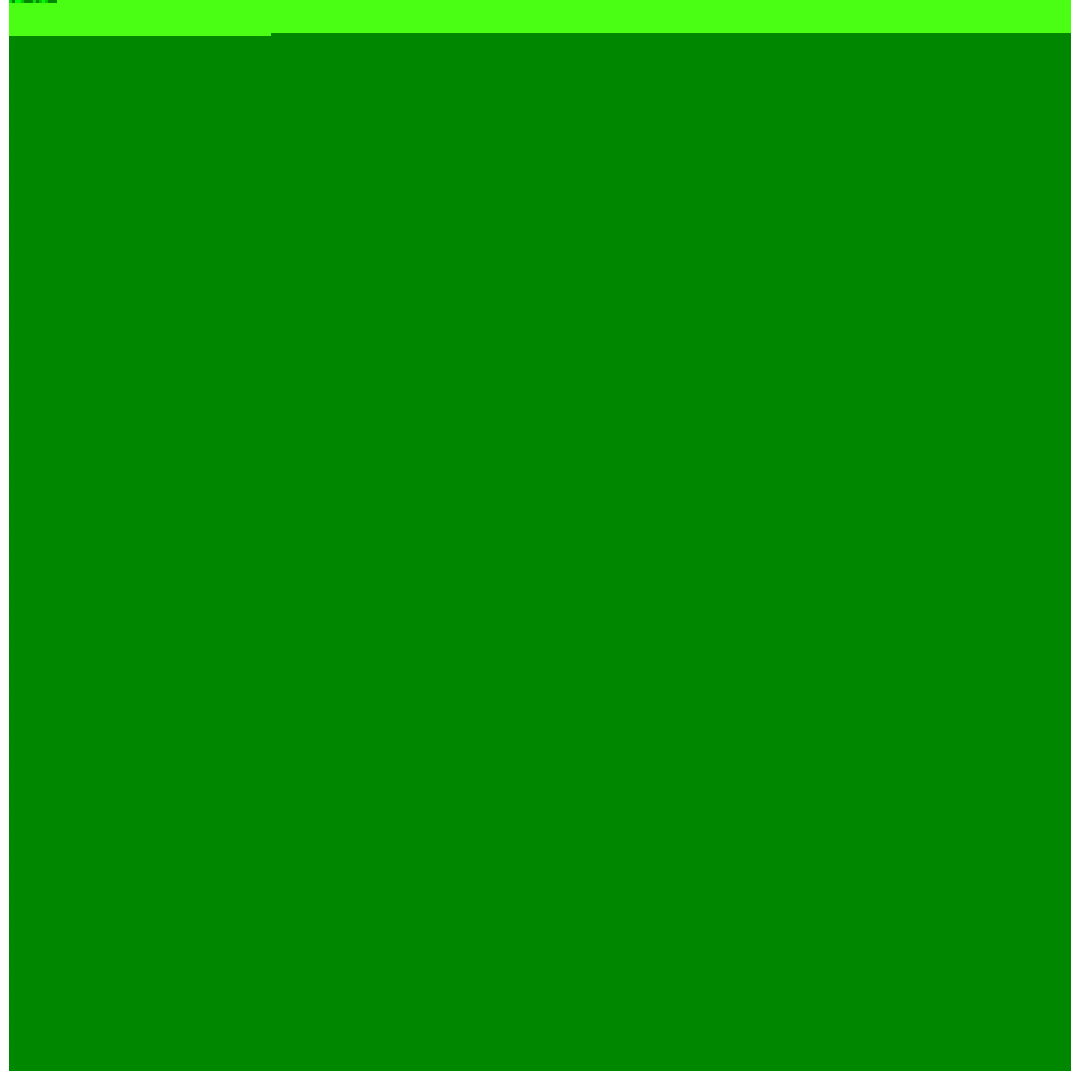
Multimodal data for Deliberate practice

Bibeg limbu, Halszka Jarodzka, Roland Klemke and Marcus Specht.

Firstname.lastname@ou.nl



Expertise development in Olympics



To become an expert, **practice deliberately**
you must

- Conscious Practice with intention of improving a particular skill
 - **Constant feedback**
 - **Planned practice which both require experts**
- Deliberate practice is **cognitively demanding** (Rikers et al., 2004)

Experts enable deliberate practice

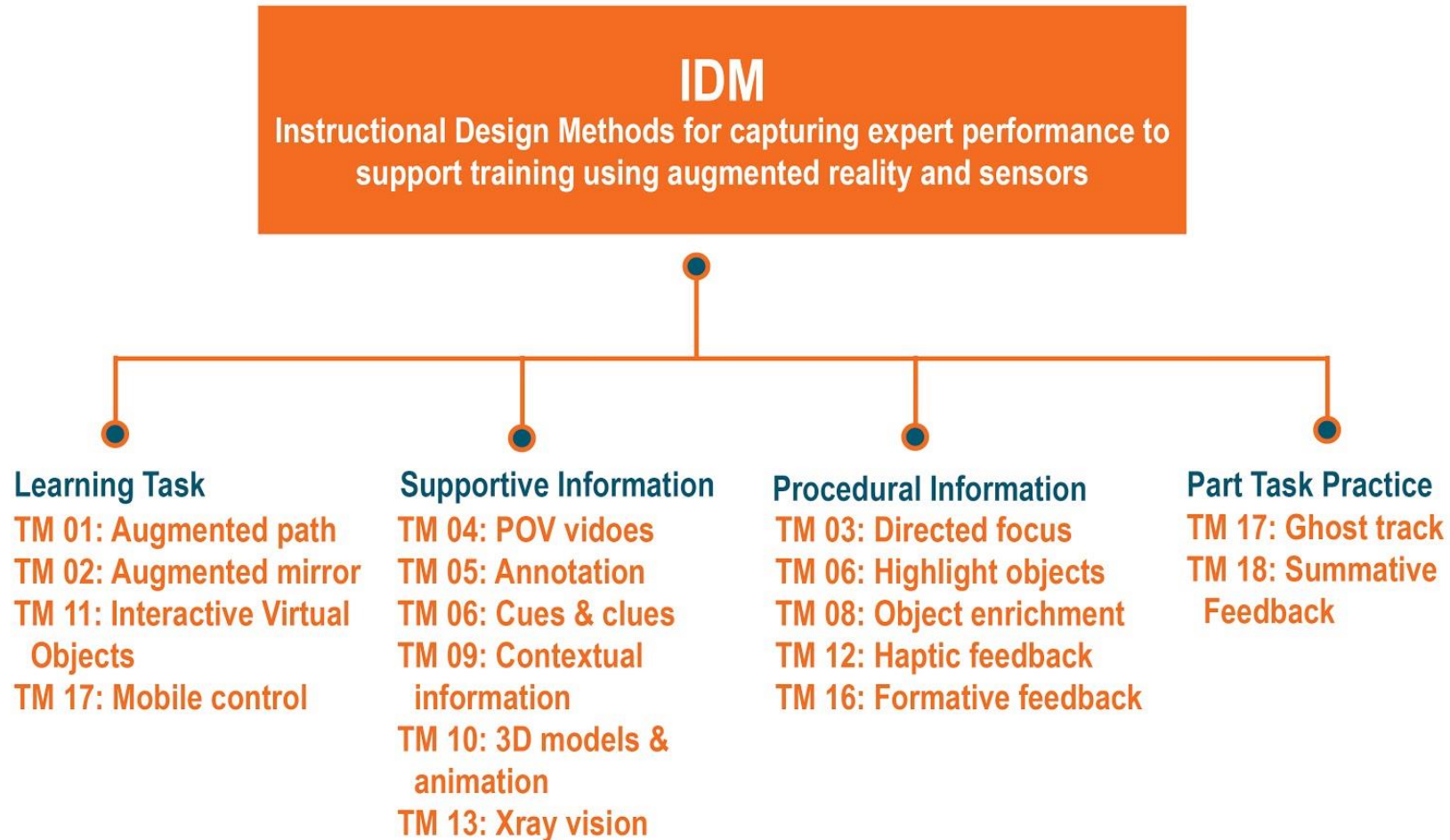
- One on One setting with an expert
- Structured practice, continuous feedback
- **But**
 - Experts are scarce and don't have time

Fostering deliberate practice

- 4C/ID supports deliberate practice principles (Neelen & Kirschner, 2016)
- Four components of 4C/ID (Van Merriënboer & Kester, 2014)
 - Learning task
 - Supportive information
 - Procedural information
 - Part task practice

Introducing sensors [Multimodal data] into 4C/ID

4C/ID Model based classification



Benefits of doing so,

- 4C/ID model is **technology agnostic** but so are sensors
- The model is **unaware of the progress or process**, but this can be complemented with sensors which can **record and monitor** performance

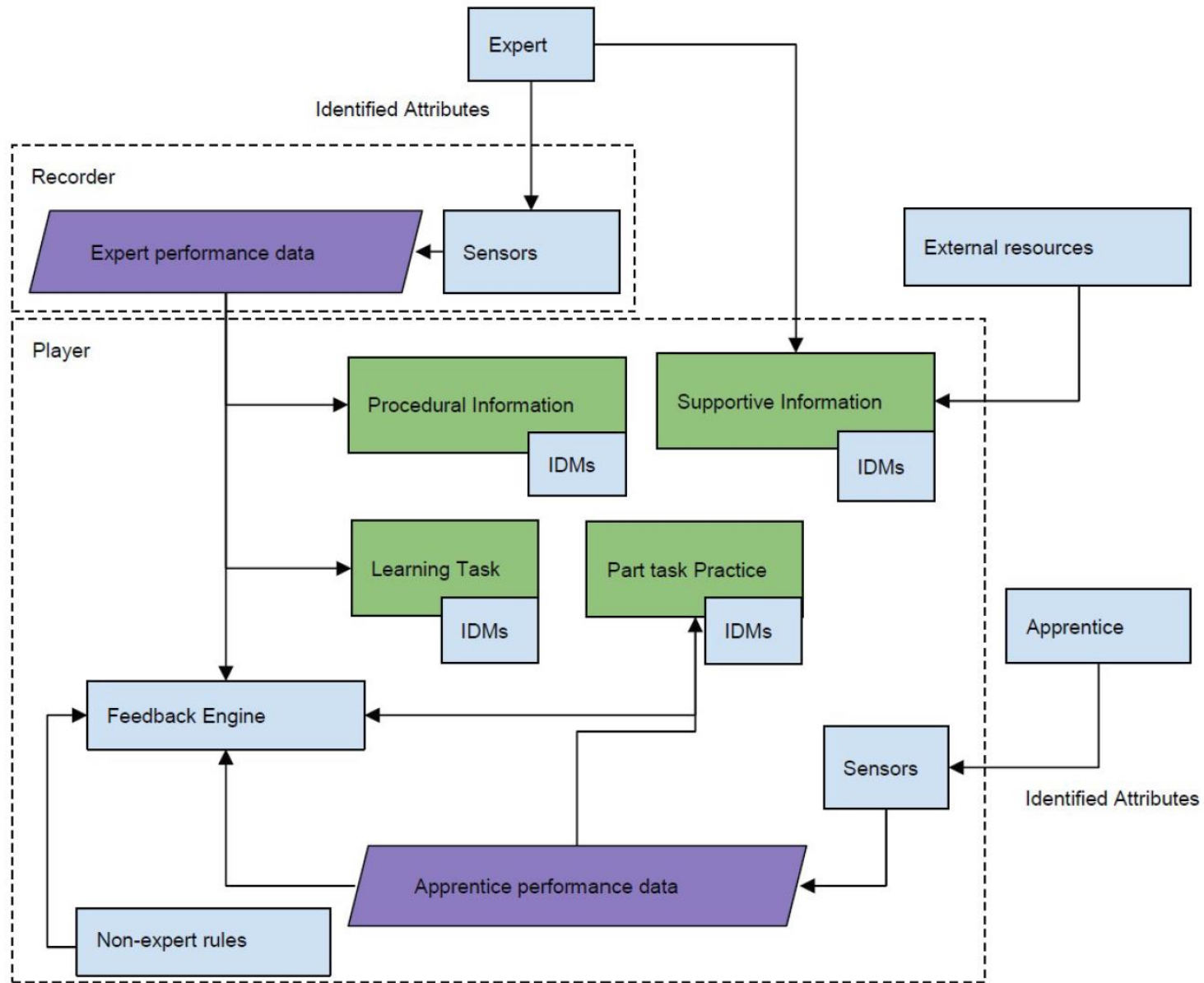


Figure 2. System Model for supporting the framework.

Table 1. Types of expert attributes identified.

Non-Expert Based	Expert Based
1. Force used to grip the pen	1. Pressure used to create the strokes
2. Angle at which the pen is held	2. Similarity of the stroke structure
3. Body posture	3. Speed of writing

Table 2. Mapping of attributes with IDMs in Calligraphy Trainer.

Attributes	IDMs	Implementation
Learning Task		
Alphabets Structure	Augmented Paths	Displayed on tablet for tracing or imitating, color of the stroke changes when the color stroke is out of bounds
Procedural Information		
Force used to grip the pen	Haptic feedback	Vibrate myo when the grip is too tight or the angle is beyond the threshold
Pressure used to create the strokes	Object enrichment	Stroke thickness is directly proportional to the pressure, The stroke darkness/lightness is also directly proportional to the pressure
Supportive information		
Speed of writing, alphabet structure	Animation	animation depicting the speed and the path in which the alphabet was written
Part task practice		
Over all performance	Summative feedback	Summative results produced by comparing with the expert recording