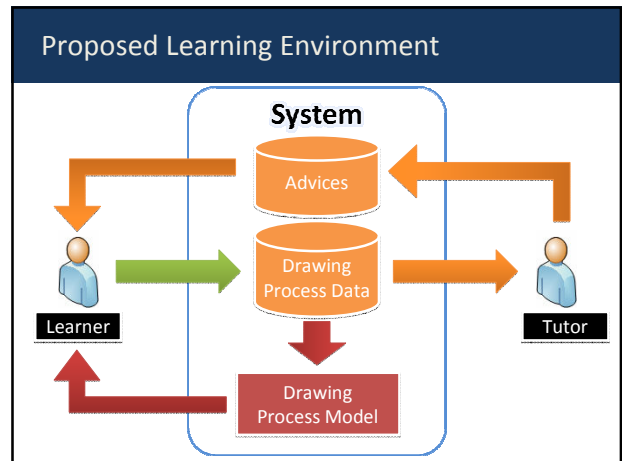


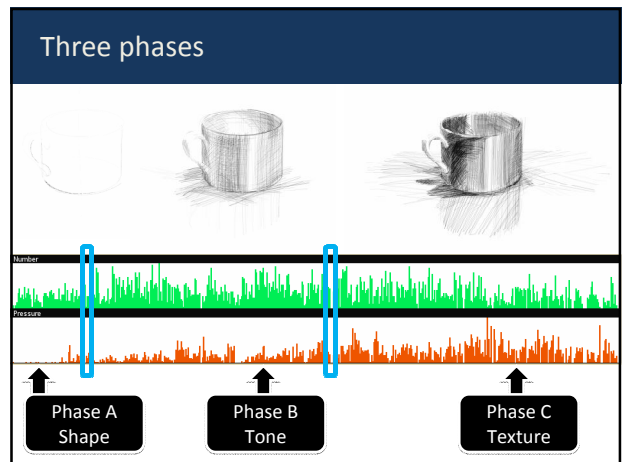
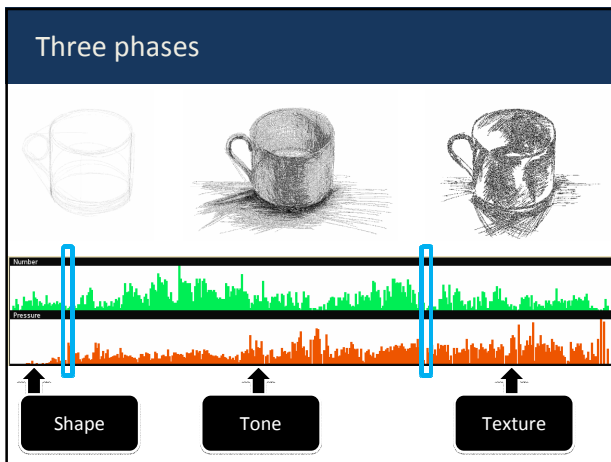
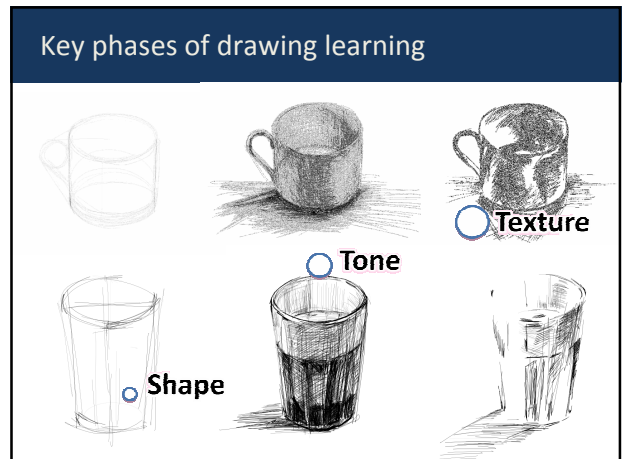
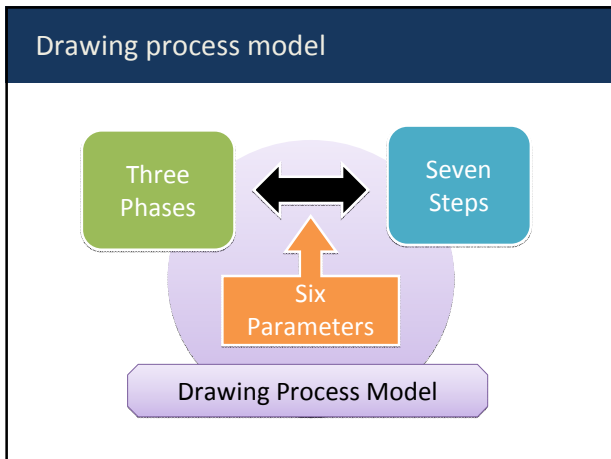
Recording a drawing-process with the digital pen

- Function
 - Automatically recording sets of time and pressure per stroke.
- Advantages
 - Concentrate in drawing
 - Direct relation with drawing process and drawing work
 - Mobility

Some Specifications of the Digital Pen

Evaluated Item	Content	Result
The maximum operating time.	Continuable drawing time; how long a fully-charged battery takes to run out of power.	210 min. (Avg., 5 trials) Max 218 min., Min 199min.
The minimum writing pressure.	Gradually touch the pen tip to the paper; measure the alteration of pen pressure and the consistency of drawn lines on the paper.	The thin and weak line (but visible) is not able to record. Meanwhile, some lines, when pen pressure is zero, are possible to record.
The maximum drawing density.	To check the limit consistency, some lines are drawn to make a crosshatch in the specific field.	The digital pen can reach the upper limit of the density as a ballpoint pen.
The limit angle for the inclination.	Tilting the digital pen right and left, in a horizontal way.	Limit angle : 43° < θ < 137°





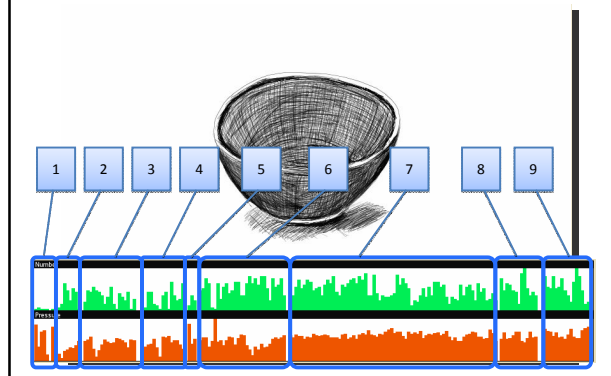
- ### Seven Steps of drawing process
- 1 • Looking carefully at the motif.
 - 2 • Interpreting where the motif is located.
 - 3 • Fixing the composition with regard to the balance of the motif and picture plane.
 - 4 • Capturing the motif as a composition of simple.
 - 5 • Analyzing the architecture of the motif and capturing the shape.
 - 6 • Adding the texture of the motif.
 - 7 • Giving final lines/curves in detail.

- ### Seven Steps of drawing process
- 1 • **Shape/Tone/ Texture**
 - 2 • Interpreting where the motif is located.
 - 3 • Fixing the composition with regard to the balance of the motif and picture plane. **Shape**
 - 4 • Capturing the motif as a composition of simple.
 - 5 • Analyzing the architecture of the motif and capturing the shape. **Tone**
 - 6 • Adding the texture of the motif. **Texture**
 - 7 • Giving final lines/curves in detail.

Six Parameters of Drawing Phases

Phase	Stroke			Stroke sets		Ratio for canvas
	Number	Pressure	Line types	Size	Dispersion	
Shape	Light	Low	Straight line, Simple curve-line	Large	Unequal	Broad
Tone	Superior	Low, Middle, High	Multiply	Large	Even	Broad
Texture	Medium	Low, Middle, High	Multiply	Small	Unequal	Narrow

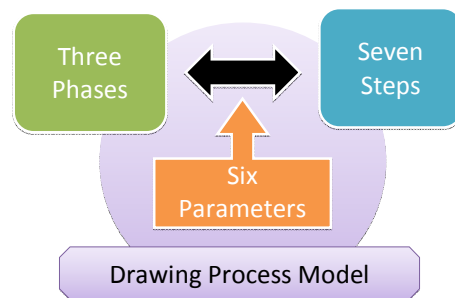
Individual Learning Support



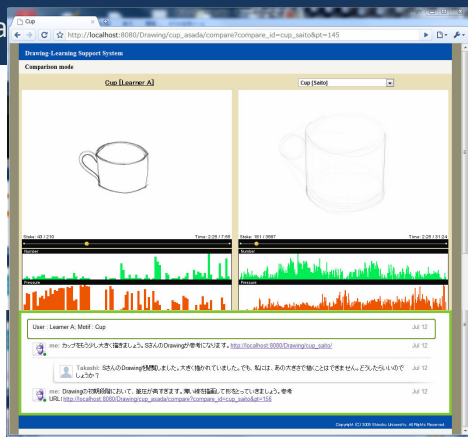
Individual Learning Support

	Stroke			Stroke sets		Width of drawings
	Number	Pressure	Line types	Size	Dispersion	
1	Light	High	Multiply	Small	Unequal	Narrow
2	Light	Middle, High	Straight, Simple curve	Small	Unequal	Narrow
3	Light	High	Straight, Simple curve	Small	Unequal	Narrow
4	Light	High	Multiply	Small	Unequal	Narrow
5	Light	High	Multiply	Small	Unequal	Narrow
6	Medium	High	Straight, Simple curve	Large	Even	Narrow
7	Superior	High	Straight, Simple curve	Large	Even	Narrow
8	Medium	High	Straight, Simple curve	Small	Unequal	Narrow
9	Medium	High	Multiply	Small	Unequal	Narrow

Drawing process



Drawing

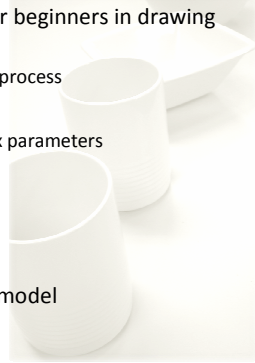


Individual Learning Support Functions

- Record/ Replay/ Refer drawing process
- Analyzing learner's drawing process
 - 6 parameters
- Showing examples of experts' and other students'
 - Drawing process
 - Final works
- Giving some advises about drawing techniques

Conclusions and Future works

- Proposed a support system for beginners in drawing
 - Using digital pen
 - Recording and reusing drawing process
- Drawing process model
 - Three phases / Seven steps / Six parameters
- Collecting drawing data
 - Experts' / Beginners'
 - Various kind of motifs
- Refining the drawing process model



Proposed Learning Environment

1. Drawing a picture with a digital pen.



Recording

2. Downloading a drawing data from pen to a PC.

3. Sending the drawing data to tutor.



5. Reviewing

4. Engaging individual study

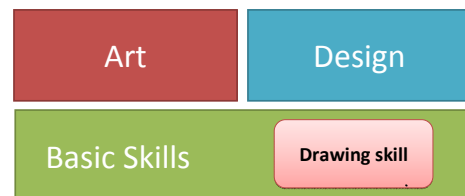
7. Confirming the giving advice, and re-drawing.

Reusing

Reusing

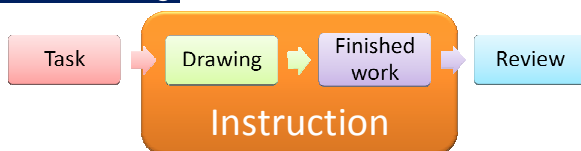
Drawing in Art Education

- Drawing is one of the basic skills in Art & Design.
- Observation-drawing is one of essential methods for developing drawing skill.

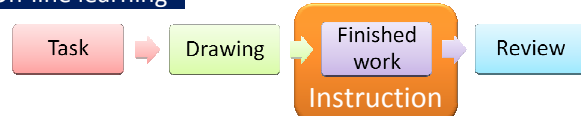


Learning Process

Off-line learning



On-line learning



Proposed learning process

