

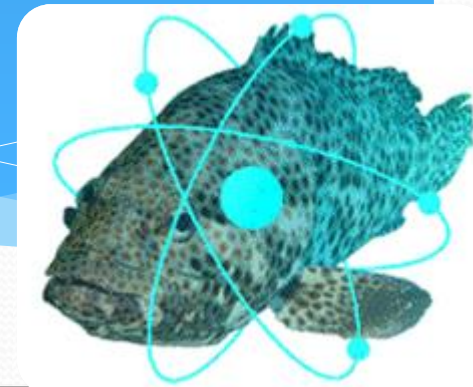
ISIB
Bruxelles



Severe accident at the Springfield Nuclear Power Plant

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Context

- ISIB - Master level
 - Nuclear Engineering



Nuclear Power Plant

- Neutron module
- Thermal-hydraulic module
- Safety module



Safety studies

Major accidents (Chernobyl, TMI, Fukushima)



Context

- ISIB - Master level
 - Major accidents
 - Technical data
 - Chronological accident progression
 - A posteriori analysis
 - « Why did operators not understand what was happening ? »
 - « Why did they (not) perform this action ? »
 - « Why did they make this mistake ? »



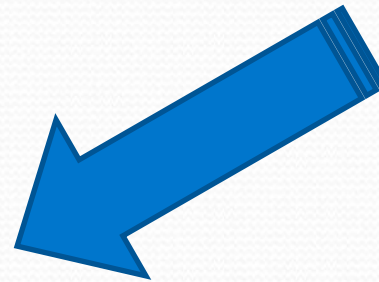
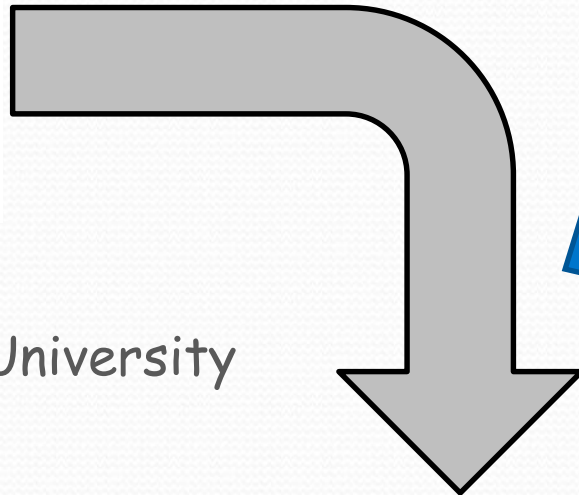
Context



French University



Human Sciences
Social Sciences

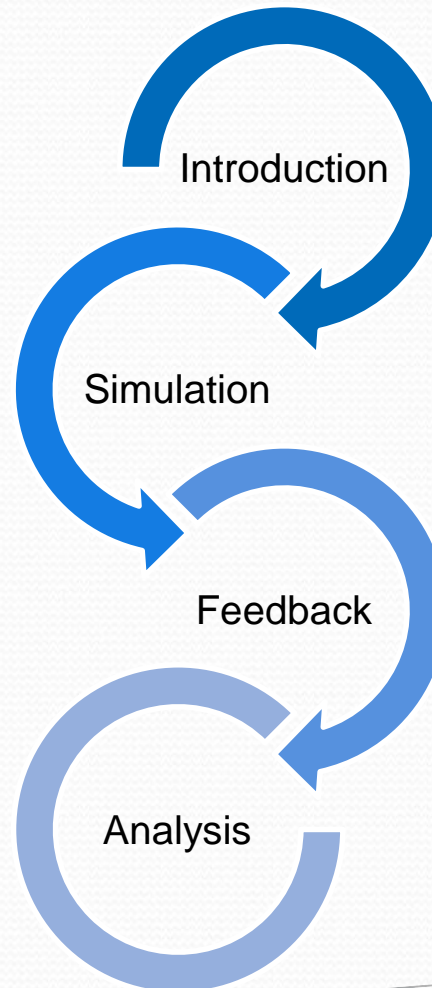


Sprintfield
Power Plant

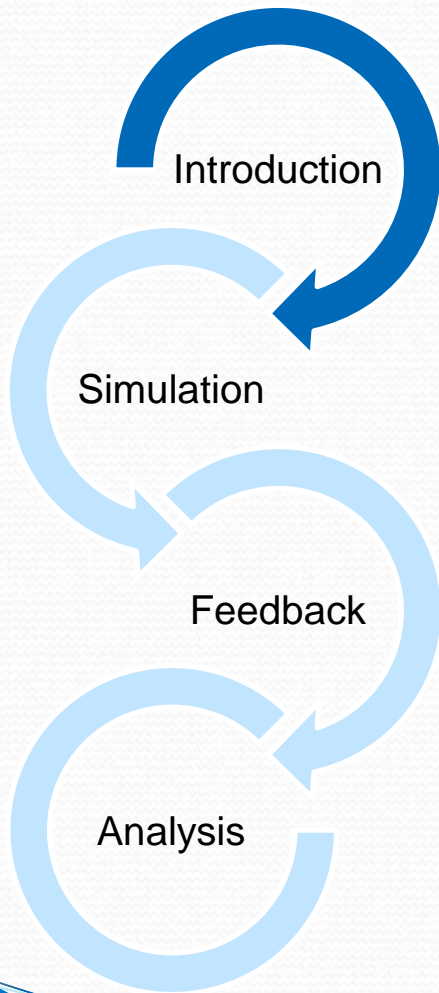
Game's description

- Serious game ?
 - What is it ?
 - A role playing game
 - Not only for fun
 - Why ?
 - Living method
 - Live and not hear
 - Active attitude in the learning (to improve the knowledge acquisition)

Game's description



Game's description



Context description (by teachers)
nuclear power plant
night shift
hand over to the day shift

(nearly) random teams and roles

Documentation reading



Game's description

Short tutorial

The screenshot shows a control room interface with the following elements:

- Time left to take action:** A digital display showing 03:36.
- Power gauge:** A gauge with a needle pointing to the right.
- Safety components warning lights:** A grid of lights labeled RV (3), 8V (4), MV (11), TP (12), FWP (10), and HPI (15).
- Feedback window:** A window showing a character named Gégé and text instructions: "HQ: wdg, go and check if the relief valve is closed.", "HQ: I just took a look, the valve is closed.", "HQ: well, then close the isolation valve manually, please.", "HQ: OK I hang up!".
- Alarms:** A panel with two columns: "Circuit primaire" and "Circuit secondaire". The "Circuit primaire" column lists: "Pressurizer on low level (toutes les 5 s)", "Radioactivity detected", "Radioactivity detected", "Radioactivity detected", "Safety injection pump A stopped", "Safety injection pump B stopped", "High pressure level in Pressurizer", "Pressurizer on low level (every 5s)", "Steam in primary circuit detected", "High pressure level". The "Circuit secondaire" column lists: "Turbine stop", "Primary pump B stopped", "Primary pump A stopped", "Feedwater pump 3 opened", "Feedwater pump 2 opened", "Feedwater pump 1 opened", "Motorpump 2 valve closed", "Motorpump 2 valve closed", "Motorpump 1 valve closed", "Feedwater pump 2 opened", "Feedwater pump 3 opened", "Feedwater pump 1 opened", "Steam in primary circuit detected".

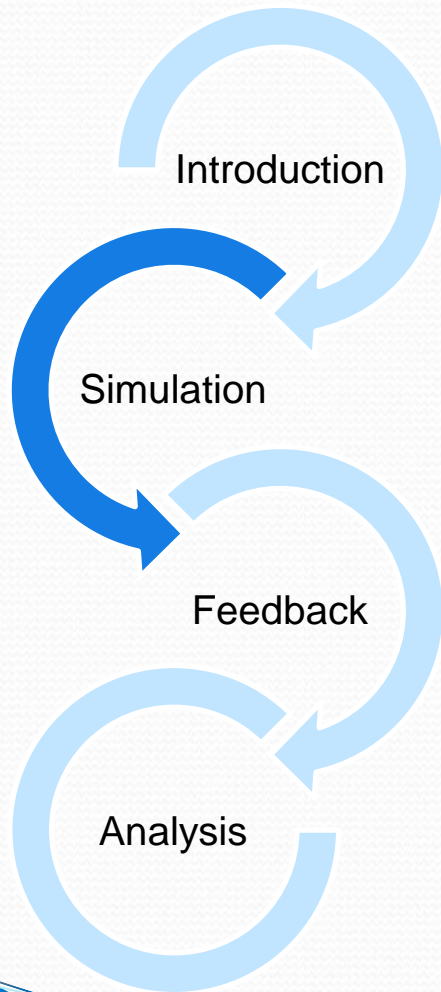
Introduction

Simulation

Feedback

Analysis

Game's description



Game phase

Scenario based on TMI

Actions are proposed
Students click to accept

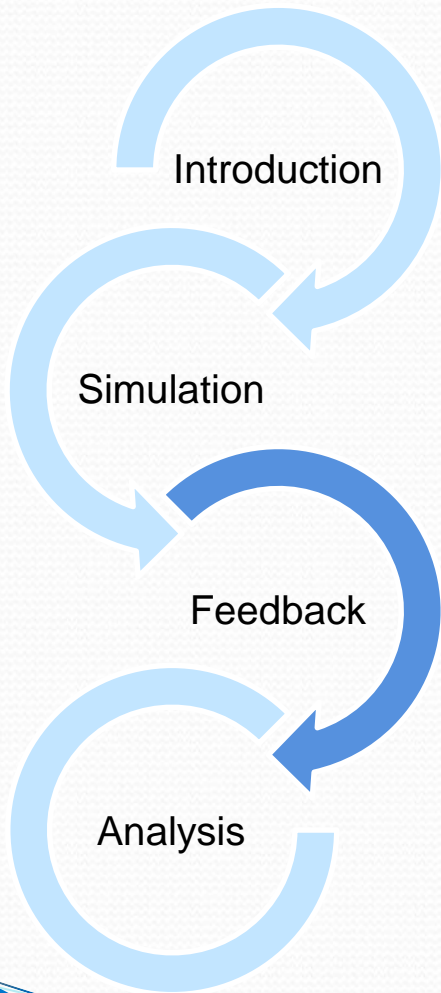
Ambiguous messages
Conflicting data
Flashing red countdown



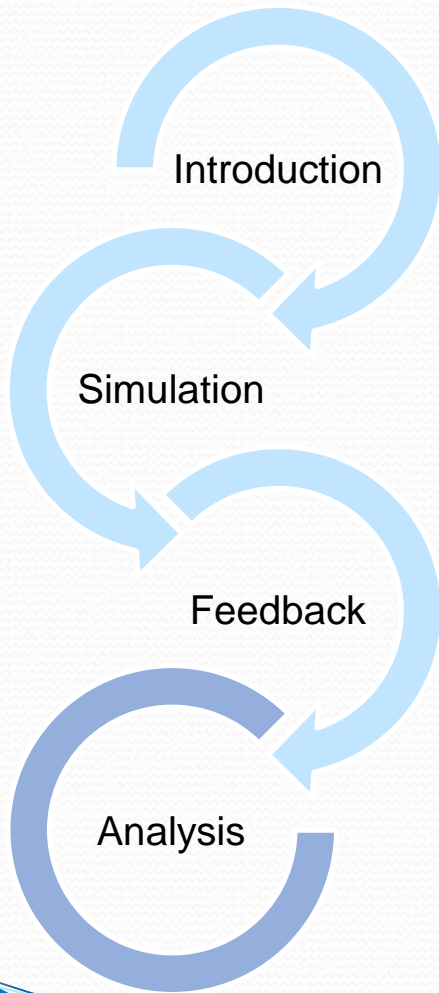
Game's description

First : a break !

Short presentation,
without specific guidelines
INES level



Game's description



Students receive the description of the plant evolution and undertaken actions

Documents about human factors

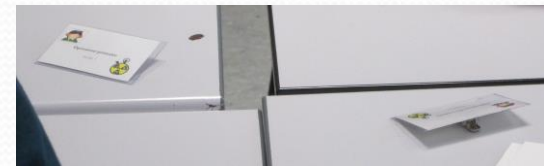
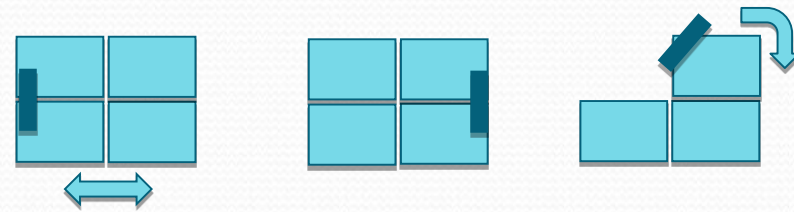
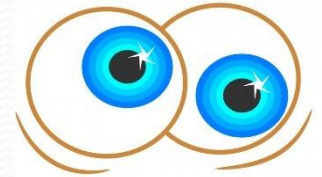
Several weeks later :

Each team presents a scientific analysis and a human analysis

Feedback from the teacher about their behaviour during the game phase.

Analysis

- Observation (by teachers)
 - Documents reading
 - Computer (Where ? Who ?)
 - Role appropriation
 - Discussion
 - Decision, consensus...



- Collaboration between specialists and no-specialists ?



Analysis

- Students

Reflex

We learned a lot
in a very funny
way

Unique
opportunity to
experiment
suches situations

Stress

We have no
time to
think before
acting

We do not take
responsibilities
into account

Conclusions and perspectives

- Powerful pedagogical device
 - Specificities of disturbed situations
 - Impact of human factor
- (Too ?) simplified interface
- Easy enough for no-specialists and realistic enough for specialists
- Apply nuclear knowledge

Conclusions and perspectives

- Prototype
- Increased interactivity ?
- Enriched scenario ?
- Several scenarios ? (wich ones ?)
- Mixed teams ?

Thank you for your attention

