



GAMIFIED COMPETENCE ASSESSMENT: EVIDENCE FROM RESEARCH

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01. INTRODUCTION

GAMES AND EDUCATION

- Lack of motivation
- Increased use of electronic devices
- Micro-learning
- Engagement
- Application

USE OF GAMES



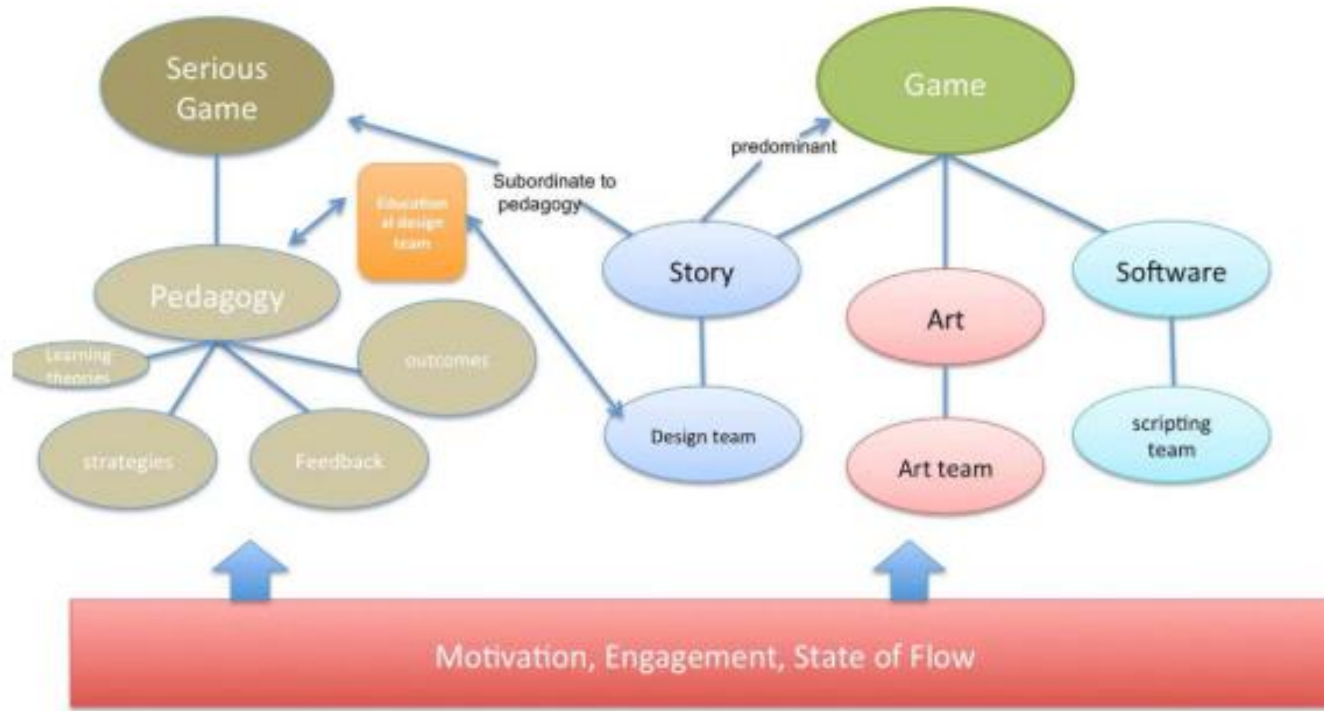
Teaching /Learning

A more engaging
experience



Assessment

Stealth assessment



Conceptions of serious games design (adapted from Zyda 2005)

KEY CONCEPTS & DEFINITIONS

- **Game-based assessment (GBA)**: using gameplay and in-game tasks to capture evidence of learners' knowledge, skills, and affective states.
- **Stealth assessment**: formative assessment embedded in game interactions; it collects process data continuously and unobtrusively to infer competencies.
- **Ontology-driven assessment** uses formal semantic models (ontologies) to describe competencies, tasks, observations and evidence models to enable interoperable, explainable assessments.

WHY GAMIFIED ASSESSMENT

- **Higher engagement & lower test anxiety:** games can motivate learners and reduce anxiety compared to traditional tests, improving the ecological validity of assessment.
- **Rich process data:** gameplay yields fine-grained traces (clicks, timing, sequences) that enable modeling of learning strategies and skill development beyond right/wrong outcomes.
- **Assessment of complex and higher-order skills:** research shows GBAs can target problem solving, creativity, and soft skills when designed with appropriate evidence models.

COMMON RESEARCH METHODS

- **Evidence-Centered Design (ECD)**: widely adopted design framework to map tasks → observable behaviors → inferences about competencies.
- **Probabilistic / ML models**: Bayesian networks, IRT variants, and deep learning are used to map in-game traces to latent competences (e.g., DeepStealth uses DL to automate evidence modeling).
- **Ontology & knowledge models**: ontologies standardize domain concepts, competency taxonomies, and evidence relationships to enable interoperability and explainability across GBAs.

VALIDITY AND RELIABILITY

- **Validity concerns:** mapping in-game behaviors to constructs requires careful task design and alignment to competency definitions; otherwise inferences may be invalid.
- **Reliability & generalizability:** studies call for larger samples and cross-context validation — many GBA studies are promising but still limited by small-scale pilots.
- **Transparency & explainability:** ontology-driven representations improve traceability of why a recommendation or score was produced.

CHALLENGES

- **Engineering cost & design complexity:** building valid GBAs with rich evidence models is resource intensive (design, data labeling, modeling).
- **Data sparsity & cold start:** especially for rare behaviors or new learners, statistical models can struggle without sufficient traces.
- **Ethics & privacy:** continuous logging raises privacy issues; transparent consent and data governance are needed.
- **Interoperability:** lack of common standards for competency descriptors and evidence limits reuse across systems — motivates ontology solutions

WHAT SHOULD WE LOOK AT

- **Hybrid models:** combine ontology/ECD-based symbolic models with ML for robust, interpretable inferences (best of both worlds).
- **Standards & ontologies:** adopt or develop shared ontologies for competencies and evidence to enable transfer and comparability.
- **Scale & validation:** prioritize multi-site trials and benchmark datasets to test reliability and fairness across diverse learners.
- **Ethical design:** integrate privacy-by-design, clear consent, and explainable outputs for learners and educators.



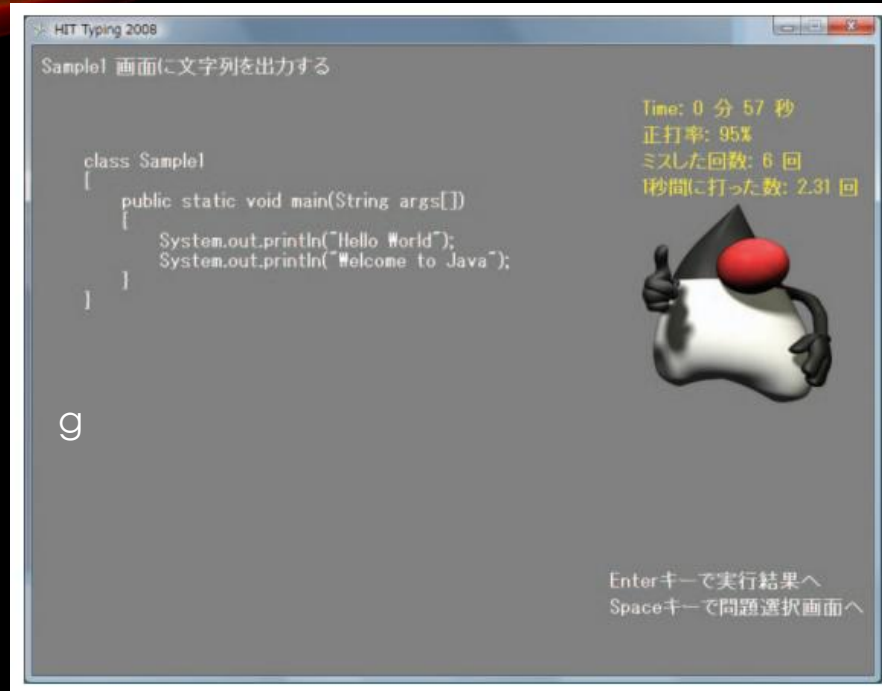
02.

GAMES IN THE ICT SECTOR

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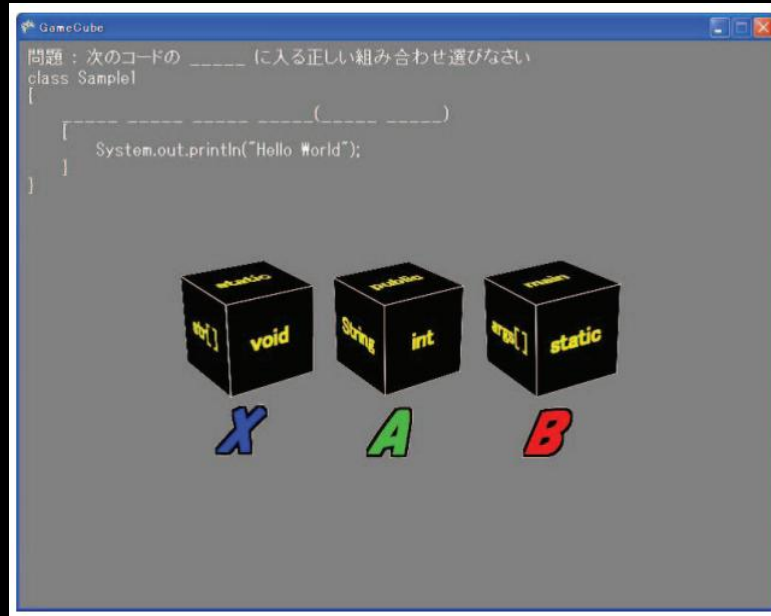
GAMES FOR TEACHING/LEARNING

- Hit Typing
- Serious Cube
- Three-dimensional (3D) action game
- Programming Learning game
- Program your robot
- Pacman



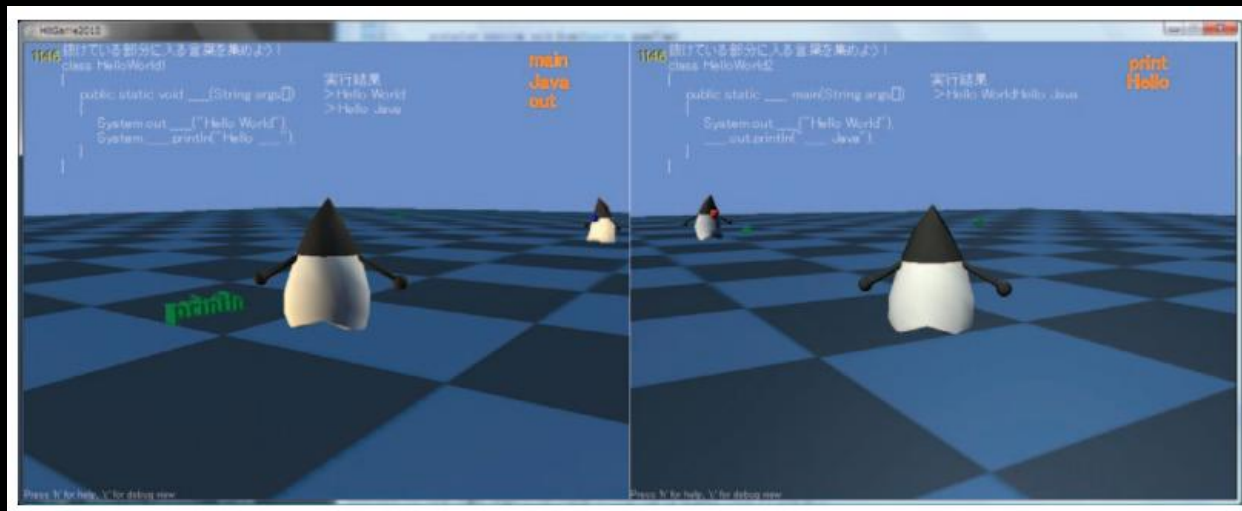
Targeted competency: coding speed

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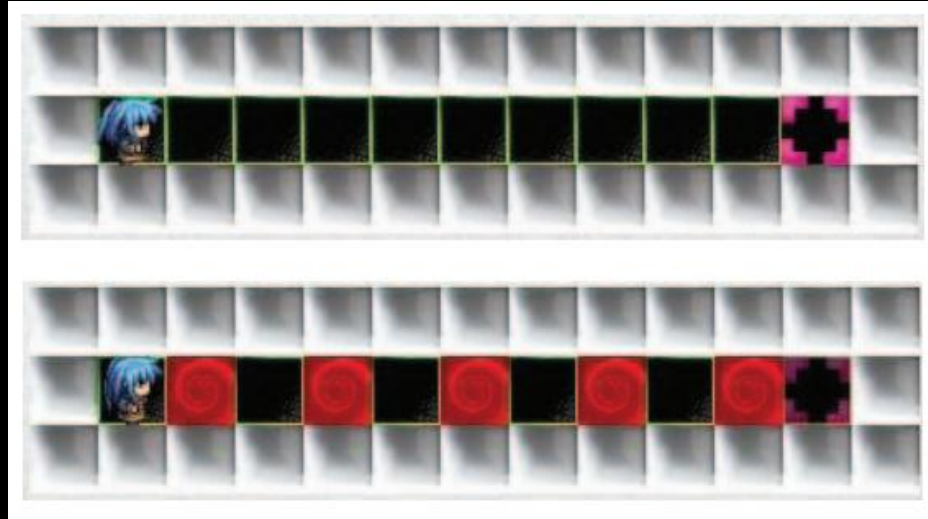


Targeted competency: coding speed

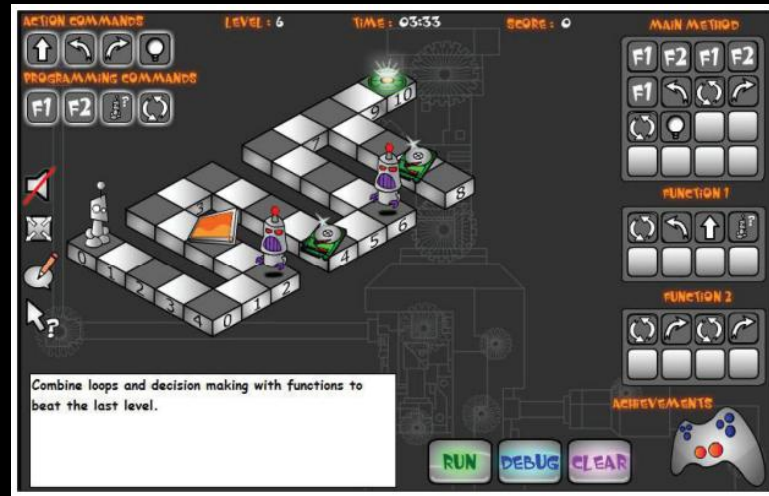
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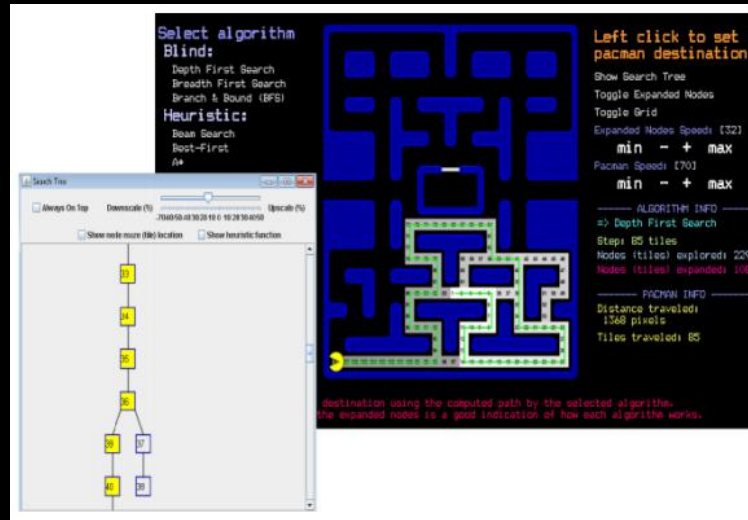
Targeted competency: coding speed
Development of competition spirit



Targeted competency: systems analysis



Targeted competency: systems analysis



Targeted competency: algorithm application

Examples of AI Competence Assessment Games

- **Adaptive Escape Rooms:**

- Platforms like the one offered by Mindsmith create custom escape room-style experiences where puzzles adapt in complexity based on a learner's responses, assessing problem-solving and critical thinking in an engaging, risk-free environment.

- **Scenario-Based Simulations:**

- Companies like Zenarate use AI to create branching narratives for sales and customer service teams, providing personalized, adaptive training to improve decision-making and communication skills.

- Coding and Problem-Solving Games:**

- CodinGame offers interactive coding challenges that gamify the assessment of programming and AI strategy skills, testing algorithmic thinking and creativity in a dynamic environment.

- Business Simulations:**

- Tools like PwC's Multipoly and Axendi's Archipelago use game mechanics to evaluate business acumen, strategic thinking, and collaborative skills, providing insights into how individuals handle complex, real-world business challenges.

- **Gamified Hiring Assessments:**

- Platforms such as Equalture and Perspect AI use game-based formats to conduct hiring assessments, focusing on fairness and accessibility by removing language and cultural barriers, and assessing behavioral traits and cognitive abilities.

- **Job Simulation Games:**

- Designed to immerse applicants in virtual work environments, these games allow recruiters to assess specific competencies and skills relevant to the job in a practical, hands-on manner.

Games: Interesting but require further work

- Game name
- Target audience
- What does the game measure?
- Concept
- Genre
- Storyline in the game
- Features
- What is the context of the game
- How to play the game
- Game progression (levels)

Games: Interesting but require further work

- Mission and the player's challenge
- How will the movement be carried out?
- What objects are in the game?
- Actions
- Characters
- Scenes
- Training and help
- Programming
- Computer hardware specifications
- Internet network



03.

THE CASE OF COMPETENCIES FOR RECRUITING STUDENTS

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Why do students fail in their studies?

- Motivation
- Quality of teaching
- Personal reasons
-
- Not suited for it

General is good but

Why do students fail in their studies?

- Egyptian ICT National Competency Framework
- From Competency to Aptitude

Why do students fail in their studies?



Why do students fail in their studies?

Let's Seg



Let's Sega Project

Cognitive skills	Soft skills	Technical skills aptitude
Problem solving	Active listening	Analysis techniques aptitude
Numerical reasoning	Planning and organizing	Modeling techniques aptitude
Processing speed	Communication and Negotiation	Hardware and software knowledge aptitude
Verbal knowledge	Team work	Programing algorithms and abstraction aptitude
Spatial aptitude	Creativity	Coding aptitude
Mental agility		Documentation concepts aptitude
Sustained attention		

Identify what to measure

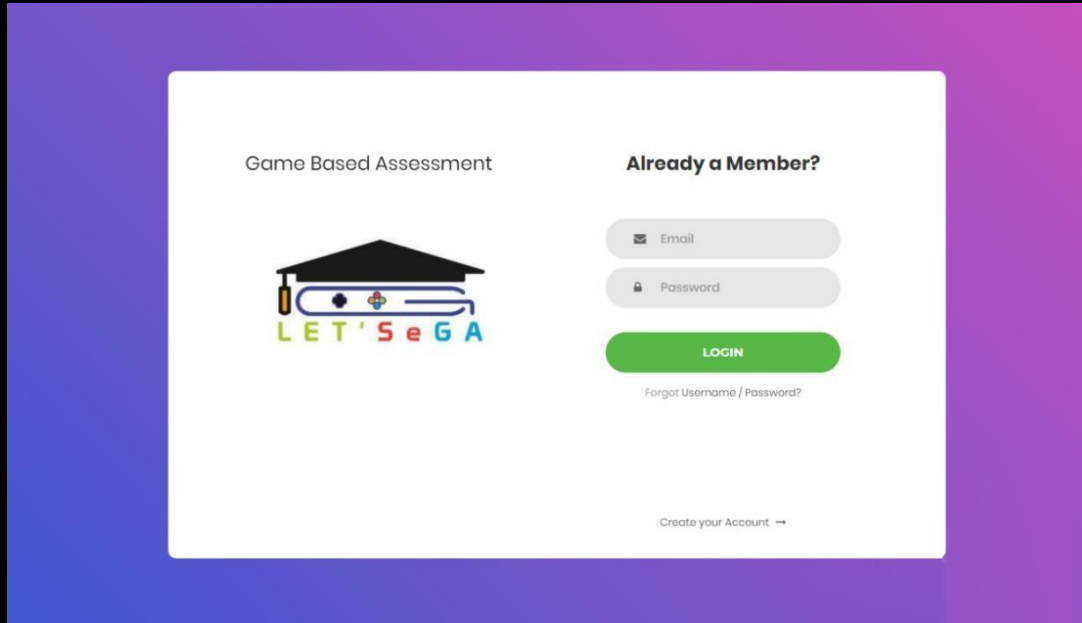
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Let's Sega Project

Competencies	Problem solving	Numerical Reasoning	Processing Speed	Verbal knowledge	Spatial aptitude	Mental agility	Sustained attention	Active listening	Planning and organizing	Communication & Negotiation	Team work	Creativity	Analysis techniques aptitude	Modeling techniques aptitude	Hardware & software knowledge aptitude	Programming algorithms & Abstraction aptitude	Coding aptitude	Documentation concepts aptitude
Technical Skills Aptitude	Cognitive Skills							Soft Skills					Technical Skills Aptitude					
Analysis techniques aptitude														X				
Modeling techniques aptitude													X					
Aptitude for Hardware & Software knowledge				X	X													
Programming algorithms & Abstraction aptitude	X																X	
Coding aptitudes	X	X														X		
Documentation concepts aptitude				X			X	X	X	X	X							

Identify which game to develop, components of a competency to measure aptitude

Le projet Let's Sega



The screenshot shows a login interface for 'Let's Sega'. On the left, under the heading 'Game Based Assessment', is a logo featuring a graduation cap and the text 'LET'S eGA'. On the right, under the heading 'Already a Member?', are input fields for 'Email' and 'Password', followed by a green 'LOGIN' button. Below the button is a link for 'Forgot Username / Password?'. At the bottom, there is a link to 'Create your Account' with a right-pointing arrow.

Portal to measure aptitudes for success in a specific domain

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Let's Sega Project

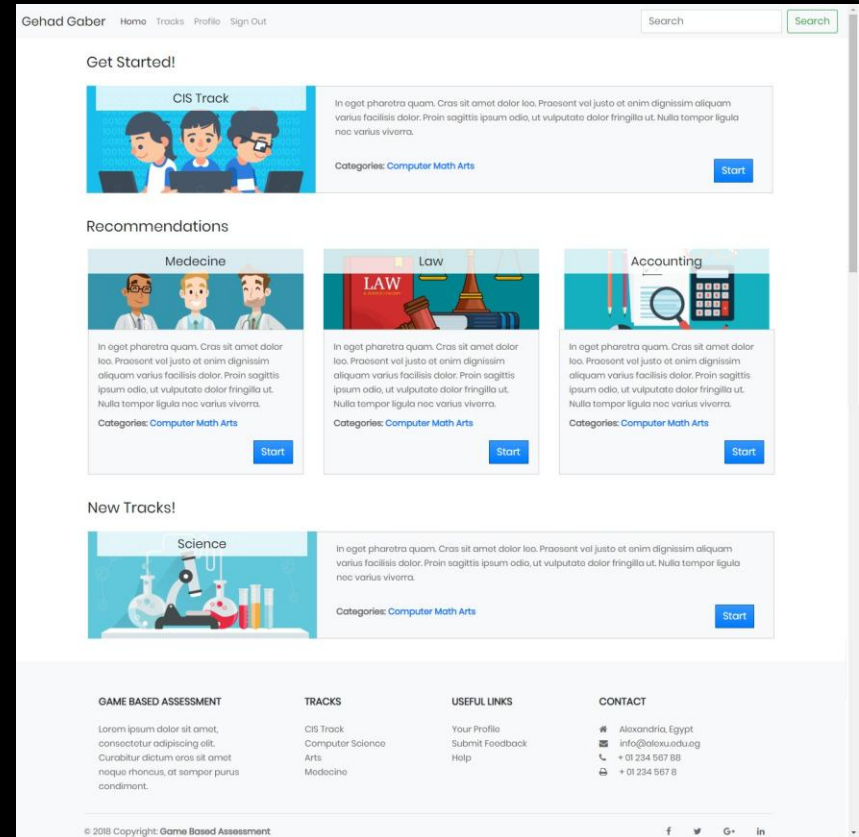
**A Serious Games Based Framework for Assessment and
Assignment of Students to Academic Programs**

Portal to measure aptitudes for success in a specific domain

33

Let's Sega Project

Portal to measure
aptitudes for
success in a
specific domain



Let's Sega Project

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Home Tracks Profile Sign Out

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Search

ICT track

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What will be tested?

Cognitive skills

Soft skills

Technical Skills

Track Requirements

Cognitive Skills	80%
Soft Skills	75%
Technical Skills	70%

Skill	Progress	Play/Retake
Cognitive Skills		
Game One	100%	<button>Retake</button>
Game Two	20%	<button>Continue</button>
Game Three	0%	<button>Play</button>
Soft Skills		
Game One	0%	<button>Play</button>
Game Two	0%	<button>Play</button>
Technical Skills		
Game One	0%	<button>Play</button>
Game Two	0%	<button>Play</button>

GAME BASED ASSESSMENT

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TRACKS

CIS Track
Computer Science
Arts
Medicine

USEFUL LINKS

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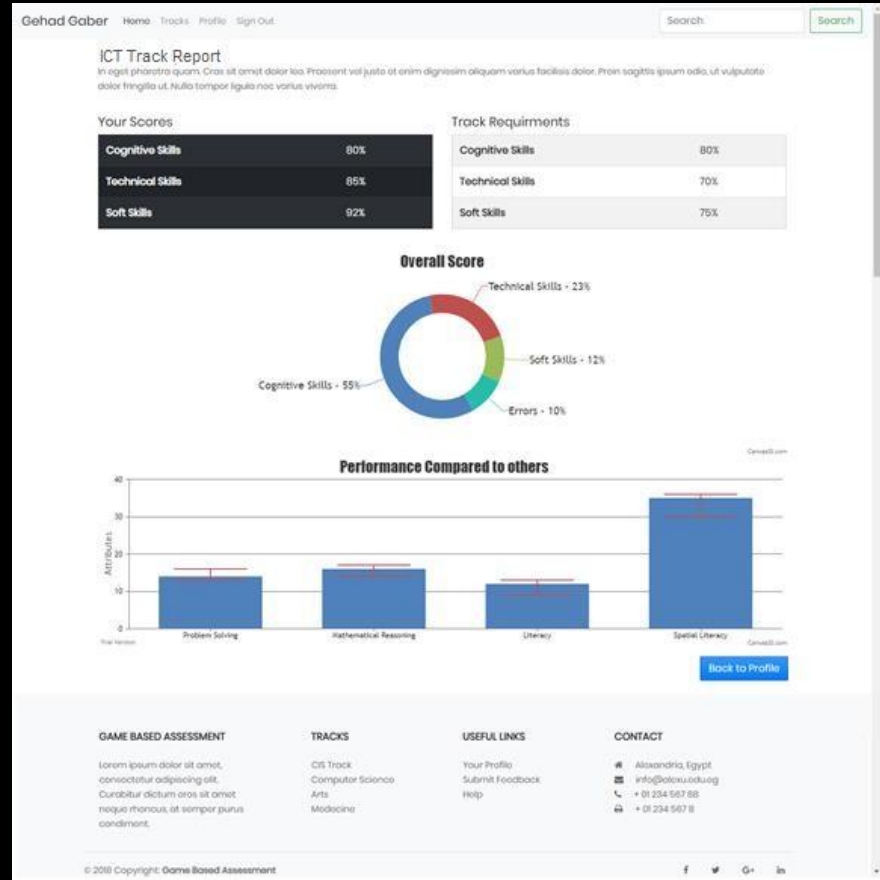
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ICT Track Report

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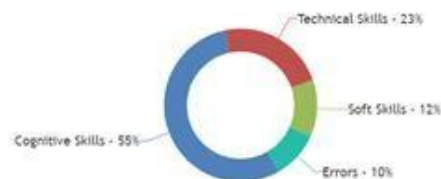
Your Scores

Cognitive Skills	80%
Technical Skills	85%
Soft Skills	92%

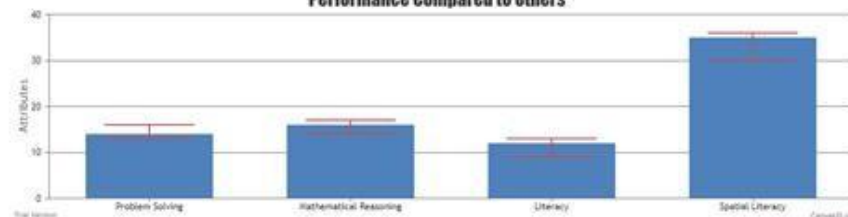
Track Requirements

Cognitive Skills	80%
Technical Skills	70%
Soft Skills	75%

Overall Score



Performance Compared to others


[Back to Profile](#)

GAME BASED ASSESSMENT

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TRACKS

CIT Track
Computer Science
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Prof. Dr. Ghada Elkhayat

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Submit Feedback

GAME BASED ASSESSMENT

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Feedback

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#	Track	Categories	Edit
1	CIS Track	Computer Math Arts	
2	Law Track	Computer Math Arts	
3	Medecine Track	Computer Math Arts	
4	Science Track	Computer Math Arts	
5	CIS Track	Computer Math Arts	
6	Law Track	Computer Math Arts	
7	Medecine Track	Computer Math Arts	
8	Science Track	Computer Math Arts	

GAME BASED ASSESSMENT

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TRACKS

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Disciplines

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Let's Sega Project... Game Example





Resume

Back







On the day of the exam, Alex went to his school and he was fully prepared for the exam.

Where Alex decided to go on a trip to
all these islands.







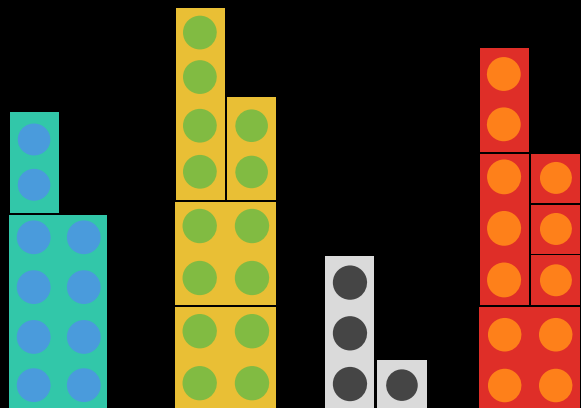






**Not finished ... Let's assess
the assessment game**

SOME FIGURES



**11 master
thesis**



**3 professors
and universities**



4 serious games



**1 recruitment
portal;**

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04. CONCLUSION

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- Work for educators
 - Work for students
 - Work for entrepreneurs



INVITATION

DEVOLOP ASSESSMENT GAMES

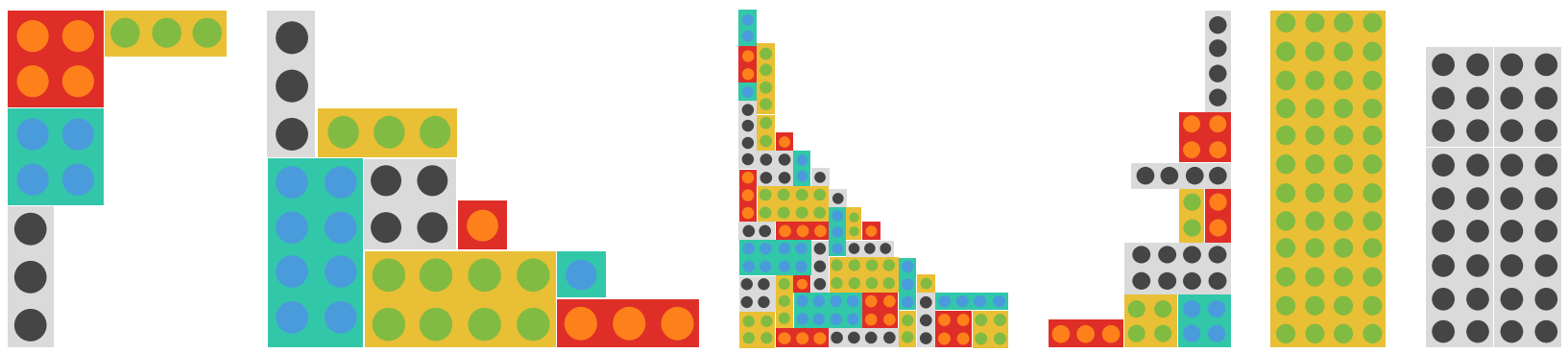
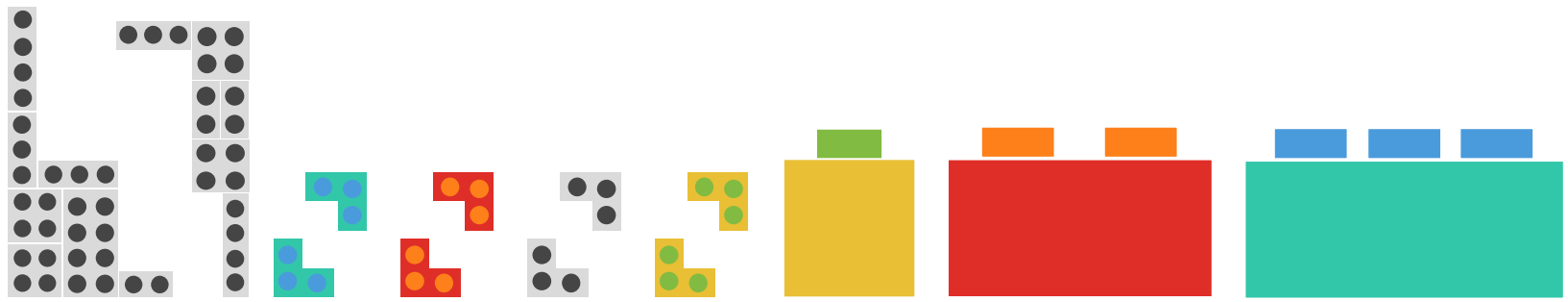
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INVITATION

LAUNCH JOINT PROJECTS

54



**“Le jeu est
une activité
sérieuse.”**

Friedrich Fröbel - pédagogue allemand



MERCI!

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