



Enhancing awareness to flood risk through hands-on models and serious games.

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Risk vs Risk Perception



Risk is the probability of an outcome having a negative effect on people, systems or assets (UNDRR, 2020).

Risk = Hazard x Exposure x Vulnerability

Risk perception is the outcome of the processing, assimilation and evaluation of **personal experiences** or **information about risk** by individuals or groups in society (Renn, 2008).

Children perception: experience & fantasy





Media Perception



Enhancing Awareness to Flood Risk



University's Third Mission



The LEGO hands-on model



A serious game in Minecraft

The children perception: fantasy



The children perception: reality





The Arno River flood on November 4, 1966

The media perception: reality or fantasy?





a "waxe's ditada citly elford and the state of about 50 Mm³...





3th mission: Awareness to Flood Risk



European Researchers' Night | Bright 2019 - Teatro del Maggio Musicale Fiorentino, Firenze

The LEGO model: design & modeling DEGLI STUDI



to facilitate understanding and perception of hydraulic risk.

The bricks are a "real" building material, simple and above all modular, which allows a tangible representation of reality, able to effectively communicate the connection between theoretical and practical aspects of risk and suitable for immediate observation of the effects due to design choices, planning activities or individual behaviour.



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1D/2D Hydraulic model with HEC-RAS

Flood scenario reproduction with LEGO bricks





FLOOD education RISK



The LEGO model: assembling





Model Framework



The **base frame** of the model (122 cm x 80 cm) is made by three layers of wood material to represent engraved **riverbeds**, **floodplains** and adjacent areas of the **river reach**.

The surface is covered with **LEGO plates**, and the **LEGO bricks** can be grafted everywhere on the surface.

The model is equipped with a water storage tank and a pumping system, for the simulation of water flows and fluvial floods. The first scenario includes: urban and industrial areas, a bridge, as well as structural and non-structural measures dedicated to the mitigation of hydraulic risk.





Model scheme





The LEGO model: public engagement



- February 20, 2020 Open Day of School of Engineering, Morgagni Campus, Florence
- February 15, 2020 FIRST LEGO League (regional selections) Morgagni Campus, Florence



campaign on best practices of civil protection, Florence. September 27, 2019 – European Researchers' Night | Bright 2019 - Teatro del Maggio Musicale Fiorentino, Florence.





December 4. 2018 - Italy-China Week of Science, Technology and Innovation - "Leonardo da Vinci" National Science and Technology Museum, Milan.

October 13, 2018 - I don't take risks: a national communication campaign on best practices of civil protection, Florence.









A serious game in Minecraft 1/2





... work in progress

Exploiting the potential of Minecraft Education Edition, a mini-game is being implemented composed of different scenarios in which the players are thrown into a reproduction of the city of Florence during a flood event. The final goal of the players is to recognise possible risk situations and learn how to avoid them, in this way they can succeed and "win"

The first "structured" scenario is set at the **Uffizi Museum**: a group of children within a visit to the museum with their teacher during a weather alert are requested by the museum's attendant to move some objects from the depot to the ground floor before the depot is flooded.

The players must recognise that they are in danger and to <u>"win" the game</u> they need to take the stairs and go on the second floor, away from the flood.



A serious game in Minecraft 2/2







... work in progress



Florence flood risk in Minecraft is a project developed in collaboration with National Institute for Documentation, Innovation and Educational Research (INDIRE), the school laboratory "Scuola-Città Pestalozzi" of Florence and Maker Camp of Marco Vigelini, a Minecraft digital educator and Minecraft Global Mentor inside the Microsoft program.



Evaluation of effectiveness





Reference Methods:

- ✓ Egame-Flow (Fu et al., 2009)
- ✓ MEEGA (Savi et al., 2011)
- ✓ MEEGA+ (Petri et al., 2016)
- ✓ Serrano-Laguna (Serrano-Laguna et al., 2017)



Evaluation Questionnaire 1/3



Demographic Information Previous Knowledge **User Experience** Questionnaire Usability Learning Feedback Please list three strong aspects of the game: Please give three suggestions to improve the game: Any further comment?

Evaluation Questionnaire

Game title:

Please, help us improve the game by answering these questions on your perception of the game's quality. All the information is collected anonymously and will be used only for research purposes. We may take some photos to document today's activity, but they will not be published without consent.

Name of the teacher/instructor_____

Place and date:

Demographic Information					
Age					
Gender		Male			
		Female			
Education level		Primary school,			
		Middle school			
		etc.)			
Occupation		Student			
		Worker			
		None			
How often do you play video games?		Never			
		Rarely			
		At least once a month			
		At least once a week			
		Everyday			
How often do you play non digital games? (Board games, cards, etc.)		Never			
		Rarely			
		At least once a month			
		At least once a week			
		Everyday			

Were you aware of this water works and tools before the game experience?

Works/Tools	Yes	No
Embankments		
Detention Basin		
Floodway canal		
Hydrometer		
Pluviometer		
Population waiting area		





Evaluation Questionnaire 3_{/3}



The road that runs along the river, in this way I can see if it overflows and flee in time

					FCOLOGY
	10 multiple choice				Learning
				Select	the correct answer. Each question has only ONE correct answer.
LEARNING	auestions	s on the			To store river water for agriculture
	question		What d	do you use a	To increase your knowledge on rivers
	game's co	ontents	detentio	on basin ior?	To store river water during a flood
					Learning
Final Assessment		Select the correct answer. Each question has only ONE correct			
FA = 1: Correct answer		Selectine	COIL	ect ans	wer. Each question has only one confect
					answer.
FA = 0: wrong answer		What do you		To store river water for agriculture	
Final Threshold		use a	To incre		ease your knowledge on rivers
FT = 6		detention	1	Γο store river water during a flood	
		basin for	<i>(</i>	To store	o store drinkable water
			What is a	a flood event?	When a watercourse overflows
					An event you can't miss
					A declaration of war by the Meteorologists
	LAS 1		What is a	weather alert	A bulletin issued by the Civil Protection that informs about the Hydrogeological risk
				?	A way to call Red, Yellow and Orange colors
					A dangerous situation
			What is meant by Critical Points?		A mathematical concept Places where water always flows, like a river or stream had
					Places where water always nows, like a river or stream bed
	-				Places where you get criticized while passing through
			How do we measure		With instruments that measures the amount of rain falling
					We almost never measure it
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			Prec	ipitation?	From the size of puddles
	B B B				With an Hydrometer
					Because they are pleasing to the eye
			What	do we need	They contribute in creating a safe habitat for plant and animal species
			Emban	nkments for?	To A contenere il corso d'acqua
					Per impedire ai pesci di uscire liberamente dal corso d'acqua
			Thorak	an orange	The shorter way, I want to get out of the rain, even if there's an underpass on the way
			weather alert going on,		The best route is definitely the one that passes by the bridge !!f it lasted all these years, why would it fall apart now?
EGO model (DICEA UNIFI): a Detention Basin is shown		which	way do you to go home?	The road that climbs the hill, it's longer but better safe than sorry	



Some remarks and future developments



Two are the **flood risk models** to enhance the **awareness to flood risk** presented here together with a **QUESTIONNAIRE** to evaluate their effectiveness.

The **LEGO hands-on model** has been shown in several **risk awareness enhancing initiatives** and **public engagement activities**.

Due to its characteristic the LEGO bricks model is aimed at the **population of the little ones** and revives the passion of **adults** for "building bricks".

The second flood risk model is a serious game set inside the **Minecraft Education world**. It exploits the potential of Minecraft world to create an **immersive role-play experience** with the involvement of a **group of children within a school laboratory**.



We look forward in playing soon and implementing the questionnaire





THANK YOU FOR YOUR ATTENTION

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