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# A serious game for debating about the use of Artificial Intelligence during the COVID-19 pandemic

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## ABSTRACT

Crises always impose a difficult compromise between safety and liberty, and the COVID-19 pandemic is no different. Governments have enforced various sanitary restrictions to reduce virus spread. With the help of Artificial Intelligence (AI), the scale of surveillance has risen to unprecedented levels. However, these technologies entail many risks, from potential errors or biases, to their extended enforcement beyond the duration of the initial crisis. Citizens should be aware that these technologies are not infallible, and measure the consequences of errors, so as to make informed decisions about what they want to accept, and for how long. To this aim, we have designed a serious game in the form of a municipal debate between citizens of a virtual town. Some first test sessions helped us improve the game design, and provided proof of the interest of this game to trigger debates and raise awareness.

## Keywords

Serious game, Artificial Intelligence, COVID-19, education

## INTRODUCTION

Crisis situations are often associated with restrictions of liberties and invasion of privacy, in the name of public safety. Many governments order mandatory evacuation or travel ban during floods, communication surveillance and control following terrorist attacks, or declare a "state of emergency" to provide their police forces with more powers to respond to the emergency situation. More recently during the COVID-19 pandemic, governments around the world have used the "state of health emergency" to justify lock-downs, curfews, contact tracing, sanitary passport, or mandatory vaccination. Surveillance has always existed, but new technologies enabled by Artificial Intelligence (AI), such as facial recognition or social networks, have changed its scale. We are now facing mass surveillance of billions of individuals. Besides, governments may be tempted to re-use technologies, initially adopted as emergency counter-measures against the pandemic, to serve other purposes<sup>1</sup>, or to extend the duration of new rules beyond the end of the original crisis. The drifts can have serious consequences, with China setting up a social credit system (Liu 2019), or some countries imposing the need for a COVID-19 vaccinal pass despite the inequalities it creates (Tanner and Flood 2021; Gostin et al. 2021; Kofler and Baylis 2020). This pass has been required to enter most countries, to access leisure places, to travel, to work (e.g. healthcare workers in France, or any workplace in Italy), or even in some countries to use some more essential services<sup>2</sup>.

AI technologies can offer many benefits, but we believe that it is essential for citizens to also understand their impact on surveillance, their potential biases and errors, in order to be able to make informed choices about what they accept and what they refuse. To this end, we have designed a serious game, where participants take on the roles of citizens with various profiles in a (not so) futuristic town, and debate about the new technologies that could be adopted in their town. This game is part of a wider series of debate games about different societal applications (health, transport) of AI technologies. This debate game is targeted at students in secondary school and high school, and is followed by a debriefing allowing participants to share experience and to learn about the real life implications of what they discussed in a simplified manner.

<sup>1</sup>For instance, Singapore police forces can now exploit the data of the contact-tracing application originally designed to fight the pandemic: <https://www.cnbc.com/2021/01/05/singapore-covid-19-contact-tracing-data-accessible-to-police.html>

<sup>2</sup><https://www.capital.fr/economie-politique/pakistan-menace-de-carte-sim-bloquee-pour-ceux-refusant-la-vaccination-1406536>

This paper is structured as follows: we start by discussing the need for educating the general public about AI, and how serious games can help. One section is dedicated to the debate game, scenario, roles taken by the participants, and different AI solutions being discussed. Another section is dedicated to the debriefing session after the game, which is key to learning. Finally, one section discusses some first return of experience with groups of different ages. Finally, we conclude and discuss future prospects.

## REQUIREMENT FOR EDUCATION

### Education to AI

Educating the population is crucial at any time and even more during COVID-19, where the lack of information, or disinformation spreading on social networks, can have serious consequences. Indeed, conspiracy theories and other fake news spread fast, and can increase vaccine hesitancy or rejection (Nieves-Cuervo et al. 2021; Lu and Sun 2022), with detrimental consequences on health. Besides, even though Artificial Intelligence can help fight COVID-19, there are also dangers to be avoided: (Naudé 2020) warns about the requirement for "a careful balance between data privacy and public health". Everybody needs to be aware of the potential benefits and dangers of Artificial Intelligence, whether in the context of the pandemic or in general.

This requirement for educating people about AI is particularly highlighted in the latest UNESCO report (UNESCO 2021). This education should not concern only the underlying technologies, but also the value and usage of personal data, and the ethical implications of AI technologies.

"because living in digitalizing societies requires new educational practices, ethical reflection, critical thinking, responsible design practices and new skills, given the implications for the labour market, employability and civic participation" [p.18].

"Public awareness and understanding of AI technologies and the value of data should be promoted through open and accessible education, civic engagement, digital skills and AI ethics training [...] so that all members of society can take informed decisions about their use of AI systems and be protected from undue influence" [p.24].

"Member States should promote general awareness programmes about AI developments, including on data and the opportunities and challenges brought about by AI technologies, the impact of AI systems on human rights and their implications, [...] accessible to non-technical as well as technical groups. Member States should develop [...] AI ethics curricula for all levels, and promote cross-collaboration between AI technical skills education and humanistic, ethical and social aspects of AI education." [p.33]

### Serious games

With the goal of involving the population as a whole in learning about AI and its use during the COVID-19 crisis, we believe that serious games (Crookall 2010) can be a powerful tool. Serious games have been successfully used in various fields: educating the population about appropriate behaviours in case of natural disasters, *e.g.* floods (Rebolledo-Mendez et al. 2009; Taillandier and Adam 2018); raising awareness about climate change and possible actions (Wu and Lee 2015); training medical and surgical skills (Graafland et al. 2012) or communicative skills of future doctors (Jackson and Back 2011); or more recently explaining the pandemic and sanitary measures to improve their acceptability (Cottineau and collective 2020).

Serious games do not need to be computerised, and we use this term to refer to any learning game, that uses playful elements to reach a pedagogical goal. There exists various forms of serious games, from computer simulations (Taillandier and Adam 2018), to board games or card games (Wu and Lee 2015), interactive narratives, role-playing games (Jackson and Back 2011), or debates (Simonneaux 2001). Given our stated goal of involving the general population, we designed a tabletop game that can be played by anybody regardless of their education, without a computer. Besides, our goal is to develop argumentation skills in future citizens, to enable them to make informed choices. We therefore propose a serious game in the form of a role-playing debate; the design of our game is explained in the following section.

## OUR SERIOUS GAME: AI AGAINST EPIDEMIC IN WAFER CITY

### Game design process

Our game is part of a larger series of debate games about AI in various fields, developed by Arbre des Connaissances (ADC)<sup>3</sup>, a scientific mediation association dedicated to opening science towards citizens. These games all take place in the same virtual (more or less futuristic) town, called Wafer city, an average size city with one million citizens. Half of the population is living in the town centre, the other half resides in suburban or rural areas. In each game of the series, a different issue is raised to the municipal council, played by the game participants. The first two episodes of the series were dedicated to AI in transport (Oct. 2018) and AI in health (Feb. 2019). The episode described here was developed by the two authors with the help of two members from the ADC, over about 1 year starting in February 2021, through to first experiments in October 2021, and until the official release in March 2022.

<sup>3</sup>Arbre des Connaissances website: <https://arbre-des-connaissances-apsr.org/>

## Game context

In our game, Wafer city is threatened by an epidemic. Each citizen of the city has a digital medical record (containing analysis results, current treatments...) managed by the city and available to its policy makers, who must take the best possible measures in order to limit the epidemics spread while addressing the following societal issues:

- Lockdown rules are considered too strict and prejudicial to mental health. It is critical to find measures that are not too restrictive for the population but still effective against the epidemic.
- The violation of rules by a few citizens could jeopardise the epidemic control strategy, thus threatening the entire population. It is therefore essential to effectively enforce sanitary restrictions, without overworking police officers by adding up to their usual missions. Besides, constraining rules might not always be well accepted and effort will be needed to prevent the deterioration of relationships between police and citizens.
- Asymptomatic people could unknowingly spread the epidemic, making it insufficient to test and quarantine only symptomatic people. However, it will be difficult to impose restrictions on healthy people who do not feel concerned. Sanitary restrictions should be adapted to the citizens' health status.

The context description purposely never mentions the name of the virus responsible for the epidemic in Wafer city, and avoids any allusion to COVID-19. Indeed, the game aims at discussing surveillance enabled by AI in a broader context, and should stay topical even after the end of the current pandemic. Besides, we also wanted to take some distance from a very sensitive context, as the COVID-19 epidemic is not over yet.

## Sowana

The Sowana company is specialised in Artificial Intelligence and has previously worked with the town on other topics, such as public transportation or health. Sowana has answered the call for proposals of Wafer city regarding the epidemic with three solutions: *Eye'Wana*, *Wana'Like* and *Wana'Pass*, detailed below.

### *Eye'Wana*

*Eye'Wana* is based on video-surveillance to ensure that sanitary rules are respected equally by all citizens at all times. It promises to unload police forces while avoiding human biases: everybody has the same risks of being controlled and fined when not respecting the rules. This solution is based on three building blocks: (i) a network of CCTVs and a fleet of drones collect videos and images from public places, (ii) computer vision algorithms extract faces from these pictures, and (iii) facial recognition algorithms identify the individuals from their face. *Eye'Wana* can detect various violations of sanitary rules (failure to wear a mask or to respect physical distancing; violation of curfew or lockdown; etc), identify the author, and notify them of the subsequent fine they have to pay.

This solution therefore answers the need for equality in front of the law, but at the cost of great intrusion into people's privacy, since it is tracking their every move.

### *Wana'Like*

*Wana'Like* is a free smartphone application to help citizens avoid crowded areas where the risk of contamination is higher. Sowana maintains a list of recommended places, checks if they respect the sanitary protocol, and can ban them if contaminations on their grounds are reported. The application analyses the user's interests from their online activity (social media posts, requests on the Sowana search engine...) to create a user profile. It also uses real-time localisation data to deduce current attendance. By combining this data, *Wana'Like* can make personalised but safe leisure suggestions, and offers discounts in partner places to further incentivise users to follow the recommendations.

This solution is much less restrictive, but potentially also less efficient. Besides, there are great risks related to commercial use of personal data, loss of privacy, or opinion manipulation. Finally, the question of accessibility to people who do not own a smartphone is also important.

### *Wana'Pass*

*Wana'Pass* is a health points passport: it analyses the user's health record and data from their sensors (heart rate, temperature...) on a daily basis, to deduce the user's individual health status and risk. It then provides them with a number of points, with users in better health being granted more points, and infected individuals receiving zero. These points will be required to access public places (shops, restaurants, museums, etc), with the riskier places



Figure 1. Extract of game card distributed to the players to describe Wana'Like - illustration © Marie Jamon

requiring more access points. Each place will need to check and debit the necessary access points; once out of points (or as long as they are infectious), the user cannot enter these places anymore.

This solution aims to answer the problem of equitable rather than equal treatment: it protects people at risk and isolates contagious individuals, while letting healthy people live more normally in order to protect their mental health. However, it poses the question of discriminating and isolating elderly people even more on the pretext of protecting them.

### Roles represented in the municipal council

As shown above, the different solutions all have pros and cons, and will be more or less acceptable to different user groups. In our debate game, participants do not play in their own name, but will assume a role as member of a specific group of citizens. The idea of having users play a role other than themselves is not new and is proven to favour perspective-taking (Jarvis et al. 2002; Resnick and Wilensky 1998). We also wanted participants to take distance from their character to keep the debate more peaceful, all the more on a very sensitive topic while the COVID-19 epidemic is still not over.



Figure 2. Extract of game cards describing two of the roles. Illustration © Marie Jamon

The participants in our game are randomly distributed in 5 small groups of citizens:

- City centre shopkeepers, focus on freedom of action and mobility, make a good living but have little free time;
- Ecologists and alter-globalists, rather young, focused on well-being of all and protection of nature, they favour walking and cycling to commute, and they ask for guarantees before adopting new technologies;
- Elderly people, over 60 years old, retired, focused on keeping their autonomy, can live in or out of town;
- Technology enthusiastic, mainly youngsters, very connected and active online, loving innovation, but with limited income;
- Remote citizens, living outside of town centre, in suburban and rural areas, either to search a better quality of life or lower property prices.

The members of each group will debate together to allocate a total of 5 points to the 3 solutions, keeping in mind the wishes of the role that they represent. Each group will therefore come up with different scores for each solution, which will be put in common and added up in the voting and debriefing phase.

## GAME DEBRIEFING

Debriefing is an important part of a serious game and is essential to learning (Crookall 2010; Whalen et al. 2018; Dieleman and Huisingsh 2006). It pursues multiple goals: clarifying concepts manipulated during the game session to improve learning; link the simplified concepts with real-life complexity to ensure that learners can apply their knowledge; and share experiences and reflection between participants. It should be led by an informed moderator with a clear and predefined pedagogical objective in mind. The following paragraphs discuss the debriefing phases of our debate game.

### Sharing and debating scores

At the end of the game, each group provides the scores they gave to each solution. The moderator reports the scores of all groups in a table drawn on the blackboard, along with their main arguments for their favourite solutions (see an example on the photo in Figure 3). The solution with the highest total score "wins" this first round of voting.

The whiteboard shows a table with columns for solutions S1, S2, and S3, and rows for different categories. The scores are as follows:

	S1	S2	S3
ALTER-glob	0	3	2
Shops	4	0	1
Remote	1	3	1
Techno	2	2	1
Elderly	3	2	0
TOTAL	10	10	5

Solution	S1 Eye'Wana	S2 Wana'Like	S3 Wana'Pass
Alter-glob	0 (-) privacy	3 (+) discounts (+) normal life (+) control over data	2 (-) unfair (-) mental health
Shops	4 (+) stay open	0 (-) lose clients	1 (-) lose clients
Remote	1	3 (-) privacy (+) discounts	1 (-) unfair
Techno	2 (+) fair, jobs	2 (+) freedom (+) discounts	1
Elderly	3 (+) health (+) live on	2 (-) no smartphone	0 (-) autonomy (-) privacy
TOTAL	10	10	5

Table 1. Transcription of the game board

Figure 3. Game board

The moderator then triggers a debate between supporters and opponents of the different solutions. For instance, members of one role group that supported a given solution, are asked to try and convince members of another role group that rejected that same solution, and vice versa. If they succeed, the scores on the board can be subsequently updated and the selected solution might even change as a result of this debate (see examples of such scenarios in the return of experience section below).

As recommended by (Dieleman and Huisingsh 2006), the debate is supervised by a moderator, who ensures a fair, peaceful and balanced debate between students. Playing a role that does not necessarily match their own opinions also helps students to take some distance with the argument and to speak more freely.

### Evaluation scales

To further discuss and compare the different technological solutions offered by AI, the moderator then asks some specific questions in order to guide students to rate solutions on different scales. Some important scales to consider when evaluating AI solutions (inspired by (Castelluccia and Métayer 2020)) include:

- Their **efficiency** (here against the epidemic): the risk-benefit balance is one key indicator, used by privacy protection agencies to allow use of a technology, and by health institutions before allowing use of a drug;
- Their impact on individuals **liberties**: how constraining or restrictive are they? How much freedom is sacrificed? Is it worth it? Does it have negative side effects, e.g. on mental health?



- Their impact on **privacy**: what sort of personal data do they collect, and how sensitive is it? Who gets access to this data? What happens in case of a data leak?
- Their economical and ecological **cost**: how much will it cost and who will pay for deploying these technologies? What pollution is generated to create, maintain, use and recycle these technologies?
- Their **accessibility** to all, and the risks of discrimination. Do they ensure strict equality? (*i.e.* everybody is treated exactly the same) Are they equitable for everybody? (*i.e.* rules are adapted to everybody)
- Risks of **errors** and misuses: what risks that these technologies fail? What impact in case of errors? What risk of misuse? Can they be twisted to serve other purposes than their initial goal? With what consequences?

### Contextualisation

To link back to reality, the moderators finally illustrate how the different virtual solutions discussed during the game actually relate to very real solutions that are already implemented in some countries.

- Technologies similar to Eye'Wana were used in China (Chun 2020), where a large CCTV cameras network with drones and thermal cameras, complemented with facial recognition, was deployed to implement social control during the COVID-19 pandemic. But drones have also been experimented in France to monitor the beaches of Nice during the lockdown<sup>4</sup>.
- Wana'Like shares many similarities with social networks, that use recommendation algorithms to make personalised suggestions to the user. These already raise many problems of conflict of interest since they aim to maximise the time spent online by the user, even at the expense of their (mental) health (Wells et al. 2021).
- Wana'pass can be viewed as the result of the progress of medical AI (Petropoulos 2020) combined with China's Social credit system (Shen 2019; Liu 2019). It can also be considered as an evolution of the health or vaccinal passport already deployed in many countries, raising discrimination problems due to unequal access to vaccines (Tanner and Flood 2021; Gostin et al. 2021; Kofler and Baylis 2020).

These examples illustrate very concretely the potential dangers of a drift from useful to forceful use of AI, and help the students take out the intended message that they are all concerned by AI and its use.

### RETURN OF EXPERIENCE

This game was first played with 6 groups from 3 high school classes during a national science fair (for a total of 103 students), as a first real-life test. It was later tested with around 80 students from an engineering school.

### Game material

The game material<sup>5</sup> comprises the following elements:

- Cards describing the roles, one different card to be distributed to each group;
- A sheet explaining the agenda of the municipal council, with the problems at hand;
- One sheet per solution, that provides the marketing argument by Sowana, some technical details about the AI beneath, and a testimony by a citizen that is designed to raise some first interrogations.
- A moderator guide aimed at the teachers who will supervise the game. This guide contains some more technical background, useful definitions, links to additional documentation, questions to feed the debate, and information about some similar but real-life solutions to present during the debriefing.

These elements are provided during the sessions we organise, but they can also be printed by any teacher willing to play the game with their students.

<sup>4</sup><https://news.trust.org/item/20200320105803-ztaq0>

<sup>5</sup>The game material and booklet are freely available at <https://jeudebat.com/jeux/lintelligence-artificielle/>

### Game setup

During the science fair, each session was played with a group of around 15-17 students, distributed in the 5 role groups, plus one of their professors present either as an observer or as a participant. The engineer school session was played with all 80 students together, distributed in 10 groups (2 per role). Each session lasted for 1.5 hours and was supervised by 2 moderators who facilitated discussions while staying neutral, *i.e.* without orienting them or making suggestions.

The pedagogical sequence is as follows:

1. The session starts with the moderators providing a brief introduction about AI, some definitions, and presenting the context of the game and the 5 roles represented in the municipal council.
2. The students debate the pros and cons of each solution in turn, within their role group.
3. Each group allocates a total of 5 points to the 3 solutions.
4. Each role group orally provides its scores and arguments that are reported on the board.
5. The winning solution is announced, and the results are discussed and debated, which might change the results.
6. The moderators provide some context about which similar solutions already exist in real life.
7. The high school teacher takes home some documentation and references to deepen the subject with their students in class later.

### Example debate

With one group, we had a very interesting debate leading to multiple changes of the selected solution. After the first round (as shown in Table 2) Wana'Pass was shortly winning with 10 points, followed by Eye'Wana with 8 points, and Wana'Like with 7 points.

Group	Eye'Wana		Wana'like		Wana'Pass	
	S	Arguments	S	Arguments	S	Arguments
Elderly	4	No phone required	1	Phone needed	0	No points for older
Remote	1	Enforcing the rules No camera out of town	0	Risk of manipulation	4	Simple
Shopkeepers	3	Equality Good for business	1	Liberty Unfair between shops	1	Losing clients
AlterGlobalists	0	Pollution Loss of privacy	2	Need guarantees on data	3	Efficiency Loss of privacy
Tech addicts	0	Loss of liberty	3	Free Discount coupons	2	Equitable
<b>Total</b>	<b>8</b>		<b>7</b>		<b>10</b>	

**Table 2. Example of blackboard after one round of discussion in one game session: scores (S), positive (blue) and negative (red) arguments.**

We then guided a debate between students favouring the different solutions, and Table 3 illustrates the evolution of total scores over the four subsequent rounds of debate.

Round	Eye'Wana	Wana'like	Wana'Pass
1	8	7	10
2	9	8	8
3	11	5	9
4	11	1	13

**Table 3. Evolution of the results of the game after four rounds.**

Since the elderly people group was completely opposed to Wana'Pass (that would most probably grant them very few points to go out), they were asked to try and convince other groups to not choose this solution. They argued



that Wana'Pass was inequitable, and convinced shopkeepers to move 1 point from Wana'Pass to Eye'Wana, and Techno-addicts to move 1 point from Wana'Pass to Wana'Like. After that second round, EyeWana was shortly ahead with 9 points, the other solutions scoring 8 points each.

Remote people were then asked to provide their arguments against Wana'Like, to which they had given 0 point. They argued that this application could manipulate its users. As a result, elderly people and central shopkeepers removed 1 point to Wana'Like and moved it to Eye'Wana, while ecologists moved 1 point from Wana'Like to Wana'Pass. Wana'Like now scored only 5 points, Wana'Pass 9 points, and Eye'Wana moved ahead with 11 points.

Finally, techno-addicts fiercely opposed to Eye'Wana (for its infringement of liberties, and because their lower income meant more sensitivity to fines) realised they could change the result: they moved 4 points from their favourite but losing solution (Wana'Like) towards their second option Wana'Pass, to prevent Eye'Wana from winning. Interestingly, it is a rare complete loss for Wana'Like (1 point), and the only win for Wana'Pass.

### Quantitative results

We consider here only the sessions played during the October 2021 science fair with 6 high school groups (103 students), who are more representative of the target public for our debate game. The results (see Table 4) are:

- Wana'Like was selected three times, mostly because it provides financial advantages and is less constraining than the other solutions.
- In another session, Eye'Wana and Wana'Like received the same number of votes. Wana'Pass was rejected for discriminating the elderly.
- Eye'Wana was selected once because it was considered easier to deploy (no need for a smartphone) and because it enforces equality. In all other sessions, it was judged too intrusive and rejected fiercely.
- Wana'Pass won only once, after the interesting debate summarised above.

	Wana'Like	Wana'Pass	Eye'Wana
#Selections	4	1	2

**Table 4. Number of wins per solution over 6 sessions (the total is 7 since there was a draw in one session)**

### Qualitative feedback

We got a general positive feedback from all the students and their professors. In this section, we discuss some specific comments made by the players after the different sessions. This highlights the importance of the debriefing phase that allows such exchanges with participants, where they take some distance from the events debated in-game.

**Link with COVID:** despite our efforts to create a "virtual" town and epidemic, most students immediately referred to "COVID" in their discussions. One student mentioned they were against the COVID vaccine, which proved the importance of maintaining some distance from the current context in order to ensure a peaceful and targeted debate. However, this occurred only during debriefing, and did not influence debates since they had to stick to their roles. Besides, we believe this link will attenuate with time as the epidemics fades, while our game will stay topical.

**Assumption of infallibility:** students generally assumed that the proposed technologies were infallible, and as a result did not consider the harmful impacts of an error. This confirms the need to teach the basics of AI as well as its potential for biases and errors. Knowing how the algorithms work is required to understand how they could also fail.

**Safety vs freedom:** students focused much more on protecting their freedom than on efficiently fighting the virus. Even though the debates did mention the efficiency of the offered solutions, it came after arguments of loss of privacy or freedom of movement, and actually after any other argument. This might not be surprising in an age group that often does not feel directly concerned by the health risk. It also shows a lack of focus on efficiency in our game instructions. We have since then improved that point by asking participants explicitly to compare the solutions on the different scales listed above, including their efficiency. This involves discussing whether they prefer to accept a very constraining (and efficient) solution for a short time, or a less constraining (but less efficient) solution that will probably need to be maintained for a longer period of time.

**Soft and hard surveillance:** while protecting their freedom and privacy, most students were either unaware of, or fatalist, regarding the surveillance already exerted on them by social networks algorithms. Most students considered that the most intrusive applications were Wana'Pass due to the use of medical data, or Eye'Wana because it films people permanently. They completely underestimate the risks associated with recommendation algorithms, since they already happily disclose large amounts of personal information on social networks. This shows that AI education should also insist on the value of personal data and what can be done with it.

**Age target:** having played the game with high school students (aged 15 to 18 years old) and engineering students (aged 22 to 24 years old), we got quite different feedback. Comments from participants tend to suggest that the game is better targeted at high school students, who have less technical background about Artificial Intelligence and feel happy to get an opportunity to discuss the current pandemic and its impact on their lives. On the contrary, engineering students felt more disappointed at the focus on ethical implications of AI when they expected to get more technical knowledge. Surprisingly, some also reported as a negative point that the solutions seemed too unrealistic because "none was good". Incidentally, this is precisely the intended take-home message: no AI technology is a perfect solution, and everybody should be aware of the pitfalls before accepting them.

## CONCLUSION

In this paper, we presented a serious game in the form of a municipal debate between players distributed in 5 role groups, in order to choose AI solutions to fight an epidemic. Changing perspective and arguing to defend one's ideas is a good exercise for students, and they seem to have learned about Artificial Intelligence and its dangers in the process. This game therefore reaches its objective of educating the population, and the debriefing phase showed crucial in that process.

In the meantime, debriefing the debates with the participants also provided us with interesting insights about how the population thinks of Artificial Intelligence, its benefits and infallibility. This comforted our idea that we need to educate the next generation about these technologies. While AI can certainly help in fighting a crisis such as the COVID-19 pandemic, it is not infallible, and as it is becoming more and more pervasive in our lives, the potential impact of errors is also becoming more serious. It is therefore necessary that everybody knows the basics behind AI algorithms UNESCO 2021 and can make informed choices about their use.

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## REFERENCES

- Castelluccia, C. and Métayer, D. L. (2020). "Position Paper: Analyzing the Impacts of Facial Recognition". In: *Privacy Technologies and Policy - 8th Annual Privacy Forum, APF 2020*. Vol. 12121. Lecture Notes in Computer Science. Springer, pp. 43–57.
- Chun, A. (2020). "In a time of coronavirus, China's investment in AI is paying off in a big way". In: *South China Morning Post*.
- Cottineau, C. and collective, C. (2020). "Understanding the current COVID-19 epidemic: one question, one model." In: *RofASSS (Review of Artificial Societies and Social Simulation)*.
- Crookall, D. (2010). "Serious games, debriefing, and simulation/gaming as a discipline". In: *Simulation & gaming* 41.6, pp. 898–920.
- Dieleman, H. and Huisinigh, D. (2006). "Games by which to learn and teach about sustainable development: exploring the relevance of games and experiential learning for sustainability". In: *Journal of Cleaner Production* 14.9-11, pp. 837–847.
- Gostin, L. O., Cohen, I. G., and Shaw, J. (2021). "Digital Health Passes in the Age of COVID-19: Are "Vaccine Passports" Lawful and Ethical?" In: *JAMA* 325.19, pp. 1933–1934.

<sup>6</sup>The game is available for download on their website at <https://jeudebat.com/jeux/lintelligence-artificielle/>

- Graafland, M., Schraagen, J. M., and Schijven, M. P. (2012). “Systematic review of serious games for medical education and surgical skills training”. In: *Journal of British Surgery* 99.10, pp. 1322–1330.
- Jackson, V. A. and Back, A. L. (2011). “Teaching communication skills using role-play: an experience-based guide for educators”. In: *Journal of palliative medicine* 14.6, pp. 775–780.
- Jarvis, L., Odell, K., and Troiano, M. (2002). “Role-playing as a teaching strategy”. In: *Strategies for application and presentation, staff development and presentation*.
- Kofler, N. and Baylis, F. (2020). *Ten reasons why immunity passports are a bad idea*.
- Liu, C. (2019). “Multiple social credit systems in China”. In: *Economic Sociology: The European Electronic Newsletter* 21.1, pp. 22–32.
- Lu, F. and Sun, Y. (2022). “COVID-19 vaccine hesitancy: The effects of combining direct and indirect online opinion cues on psychological reactance to health campaigns”. In: *Computers in human behavior* 127, p. 107057.
- Naudé, W. (2020). “Artificial intelligence vs COVID-19: limitations, constraints and pitfalls”. In: *AI & Society*, pp. 1–5.
- Nieves-Cuervo, G. M., Manrique-Hernández, E. F., Robledo-Colonia, A. F., and Grillo, A. E. K. (2021). “Infodemic: fake news and COVID-19 mortality trends in six Latin American countries”. In: *Pan American Journal of Public Health* 45, e44–e44.
- Petropoulos, G. (2020). *Artificial intelligence in the fight against COVID-19*.
- Rebolledo-Mendez, G., Avramides, K., De Freitas, S., and Memarzia, K. (2009). “Societal impact of a serious game on raising public awareness: the case of FloodSim”. In: *Proceedings of the 2009 ACM SIGGRAPH symposium on video games*, pp. 15–22.
- Resnick, M. and Wilensky, U. (1998). “Diving into complexity: Developing probabilistic decentralized thinking through role-playing activities”. In: *The Journal of the Learning Sciences* 7.2, pp. 153–172.
- Shen, C. F. (2019). *Social credit system in China*. Tech. rep. City University of Hong Kong.
- Simonneaux, L. (2001). “Role-play or debate to promote students’ argumentation and justification on an issue in animal transgenesis”. In: *International Journal of Science Education* 23.9, pp. 903–927.
- Taillandier, F. and Adam, C. (2018). “Games ready to use: A serious game for teaching natural risk management”. In: *Simulation & Gaming* 49.4, pp. 441–470.
- Tanner, R. and Flood, C. M. (2021). “Vaccine Passports Done Equitably”. In: *JAMA Health Forum*. Vol. 2. 4. American Medical Association, e210972–e210972.
- UNESCO (2021). *Report of the Social and Human Sciences Commission (SHS)*. Tech. rep. 0000379920. UNESCO.
- Wells, G., Horwitz, J., and Seetharaman, D. (2021). “Facebook knows Instagram is toxic for teen girls, company documents show”. In: *The Wall Street Journal*.
- Whalen, K. A., Berlin, C., Ekberg, J., Barletta, I., and Hammersberg, P. (2018). “‘All they do is win’: Lessons learned from use of a serious game for Circular Economy education”. In: *Resources, Conservation and Recycling* 135, pp. 335–345.
- Wu, J. S. and Lee, J. J. (2015). “Climate change games as tools for education and engagement”. In: *Nature Climate Change* 5.5, pp. 413–418.