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This is the submitted version (pre peer-review, preprint) of the following publication:

Published Version:

Blasioli, S., Pennisi, G., Piovano, T., Rossini, E., Moretti, G., Perotti, F., et al. (2024). SafeLab Challenge: A gamification tool for testing and advancing knowledge on workplace safety. IATED [10.21125/edulearn.2024.1137].

Availability:

This version is available at: <https://hdl.handle.net/11585/997487> since: 2024-11-28

Published:

DOI: <http://doi.org/10.21125/edulearn.2024.1137>

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A GAMIFICATION TOOL FOR TESTING AND ADVANCING KNOWLEDGE ON WORKPLACE SAFETY

S. Blasioli, G. Pennisi, T. Piovano, E. Rossini, G. Moretti, F. Perotti, F. Orsini

Department of Agricultural and Food Science, University of Bologna (ITALY)

Abstract

A training course on workplace safety requires ensuring active and engaged participation, ultimately enabling workers to acquire important information on their own safety and that of colleagues in the workplace. Whenever regulatory frameworks on workplace safety training are lacking, vehiculating information in alternative ways (e.g., in the form of a board game) may be stimulating for the participants.

Among existing commercial board games, some have been designed to test and boost knowledge on a wide variety of topics, including geography, entertainment, history, art and literature, science and nature, sports and leisure, with players moving along a board and gaining virtual currencies or qualifications during the game on the different categories. The adoption of multiple-choice tests is common, and competitors are commonly requested to prove their skills on different topics. In the framework of an ongoing Horizon Europe project targeting the dissemination and adoption of simplified plant cultivation technologies in Africa (InCiTis-Food, with grant agreement nr 101083790), a board game was drafted for holding a safety training in Nigeria. The workshop involved managers and trainers from 8 Living Labs located in Kenya, Ghana, Nigeria, Sierra Leone, Cameroon, and Gabon, as well as university students of degree courses in agriculture and aquaculture. The board game – named *Safesab Challenge* – was based on 6 categories that targeted safety practices, including “Personal safety”, “Safety of others”, “Safety of the environment”, “Safety of the community”, “Safety of the workplace” and “Hand and power tool”. For each category, 25 questions were prepared. Participants were grouped into competing teams, and the board was placed on the ground, where their token landed – they would have to respond a multiple-choice question of a specific category among the 6 listed above. Participants actively engaged to the game, being competitive and rejoicing at each correct answer. After every answer, an explanation was elaborated jointly with the group of trainees, in order to better fix the concepts. The game had also the role to reinforce the relationships inside the group, beyond cultural differences, as also evidenced through a survey addressing participant satisfaction and acquired knowledge.

Keywords: Learning by Playing, Extension, Boardgame, Safety, Training.

1 INTRODUCTION

Workplace safety refers to the provision of a safe working environment, safe equipment, policies, and procedures to guarantee the health, safety and well-being of all persons in employment and is concerned with eliminating injuries, risks, and hazards. Workplace safety training courses are essential for creating a safe and healthy work environment. These courses typically cover topics such as hazard identification, emergency procedures, proper use of equipment, ergonomics, and more. Traditionally, safety trainings are provided as classroom lectures, videos and printed safety manuals. These methods can be defined unidirectional since the flow of information is only from the instructor to the trainees (and not the opposite); the participant in the training is required to pay attention and listen to the teacher with no or limited interaction [1,2]. This approach has the advantage to vehiculate a lot of theoretical information in a short period and reaching up to a large number of participants [1,3]. Conversely, trainees are a passive audience during the learning process, which often leads to scarce learning results, reduction of attention and boredom [1,4]. Gamification can be described as the process of transforming any activity, system, service, product or organizational structure into a distinct process that facilitates positive experiences, similar to those associated with games, with the aim of facilitating changes in behavior or cognitive processes [5-7]. The idea behind gamification is that it harnesses people’s natural competitive nature and intrinsic desire for recognition to encourage them to complete tasks or interact with products or services [7,8]. In recent years, gamification has been applied to many different situations and activities, such as marketing, education, healthcare, etc [9-11]. In the framework of safety training, for example, virtual reality serious games have been used as a hands-on training tool to motivate and engage trainees [1]. This work aimed to present *Safesab Challenge*, a new board game that has been

Challenge asks players to correctly answer questions about workplace safety offering them explanation of the correct answer. Questions are formulated as multiple-choice tests that are widely used in education and assessment settings due to their efficiency, ease of grading, and ability to measure a broad range of knowledge and skills [12]. In this paper, the results of a survey addressed to participants for evaluating their level of satisfaction and learning were also reported.

2 METHODOLOGY

The board game contains a game board [13], 125 question cards, 2 dice, 38 location cards, 4 production degree card and 6 tokens. The game board displays a circular track from which departed 6 crookes converging in the hub (Fig. 1). The circular track and the crookes are divided into 6 categories of difficulty levels according to specific safety information categories: "General safety information", "General practices", "Occupational risk", "First-aid", "Outbreak control", and "Hand and power tools". For each category, 25 multiple-choice questions were prepared. To start the game, players must randomly select the starting position and position all the six crookes in their category. Players have to randomly answer questions in their category moving around the game board in all directions. When cards are collected, positioning own token in one of the 6 crookes (one for each category) at the base of each spoke, namely "the crookes" and randomly answering the question. Once collected the question and the crooke category, the player must randomly select the crooke to answer the question for giving the production degree and



Figure 1. [redacted] board game.

In order to measure the engagement and motivation of the participants for workplace safety training, a qualitative method was used. A survey was distributed to players, structured in 7 questions for testing the level of satisfaction towards the proposed activity. Collected answers were processed by using Microsoft Excel 365 and the results expressed as percentage.

3 RESULTS

The [redacted] has been launched during the workshop on "Simplified hydroponic systems" held in Nigeria in February 2024, in the framework of InCiTis-Food (Integrated and Circular Technologies for Sustainable city region FOOD systems in Africa) project [14]. InCiTis-Food is a project funded by the European Union started in January 2023 targeting the dissemination and adoption of simplified cultivation methods. The workshop was addressed to managers and trainers involved in the management of 8 Living Labs located in several countries of Equatorial area as Kenya, Ghana, Nigeria,

Sierra Leone, Cameroon, and Gabon, as well as university students of degree courses in agriculture and aquaculture. The workshop was organised in two sessions, one in class (Fig. 2) and one in an open-air laboratory where the practical session has been held (Fig. 3).



Figure 2. In class session of the workshop held in Nigeria.

The game has been proposed at the closure of practical activities, after one week of intensive hands-on activities performed by participants. It was used to train “workers” about workplace safety vehiculating serious information in an informal way. This methodology was chosen for ensuring active and engaged participation of trainees in those contexts in which, the level of attention may be low (for example, due to the extreme climatic conditions registered in Nigeria) and the safety procedures are lacking. During practical session, all participants were actively involved in realization of simplified cultivation systems. Electric drills, saws, hammers, flames, were daily used for building wood basins and scaffolds for sustaining plants. Since these tools require special care when handled, their safe use has been included among the topics to be covered during safety training. The handling of chemical substances for mixing fertilizers and mineral salts into nutrient solutions were also considered. Being the activities occurred in open air, the risks connected to outdoor activities has been treated. Since the InCiTis-Food project was focused on food production, food safety was also included among the arguments of interest. Finally, general safety information was furnished to trainees and the good practices to hold on own workplace were described.



Figure 3. Practical sessions of the workshop held in Nigeria.

3.1 The game





Figure 4. A moment of the game.

3.2 The survey

At the end of the workshop, a survey (Table 1) was distributed to the participants in order to test the appreciation towards the methodology used for learning rules and procedures in the framework of the workplace safety regulations.

Table 1. Questions proposed in the survey.

Questions	Multiple-choice/Open answer
1. Were the hands-on activities and demonstrations helpful in understanding general concepts?	Yes/No
2. How would you rate the clarity of the workshop presentations?	Excellent/Good/On average/Not good
3. In your opinion, have you acquired solid and lasting skills from your participation in the workshop	Yes/No
4. What did you like most about the workshop?	Open answer
5. What did you like least?	Open answer
6. What improvements, if any, would you suggest for the workshop format or content?	Open answer
7. On a scale of 1 to 10, how satisfied are you with the workshop?	From 1 to 10

The first three questions have received 100% of positive feedbacks; the clarity of presentations was evaluated excellent by 70% of participant and good by the remain 30%. Engaged activities, the skills of the instructors, the creativity, and the gamification were appreciated by almost the 70% of trainees whereas the 30% have expressed good opinion about the cooperation among all participants and the context. The 60% of trainees have declared that nothing was least liked, and 40% blamed their disappointed to technical problems (audio quality during workshops, lacking tools for hands-on activities, etc.). More than 30% of participants had no suggestions to propose for improving the workshop, the remain percentage had suggested to extended workshop duration and ameliorate equipment. The pie chart in Fig. 5 reports the level of satisfaction with the workshop: more than 80% trainees have assigned a score higher than 8 to the proposed activities.

On a scale of 1 to 10, how satisfied are you with the workshop?

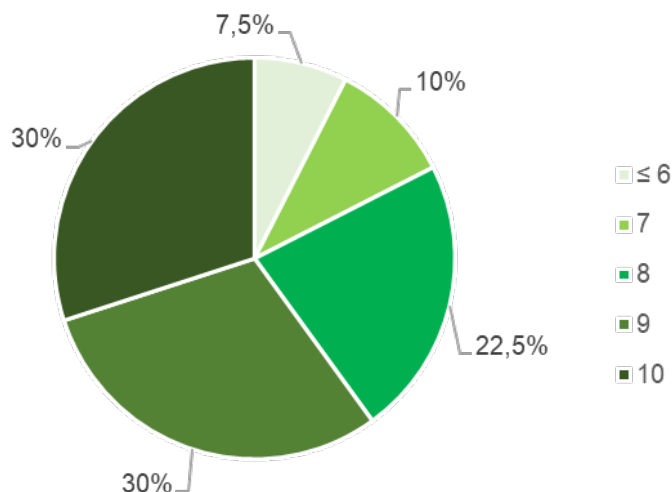


Figure 5. Level of satisfaction of trainees at the end of the workshop.

4 CONCLUSIONS

Playing the [REDACTED] serious game significantly increased intrinsic motivation and engagement of the trainees. They were more active, attentive and enjoyed the experience. The game had also the role to reinforce the relationships inside the group, beyond cultural differences. The proposed game could find application in combination with conventional methods, as a complementary tool to provide more frequent and smaller sessions, mainly addressed to workers with experience in workplace safety training.

ACKNOWLEDGEMENTS

The present research was funded by the Programme of Research and Innovation of the European Union Horizon Europe, under grant agreement nr 101083790 (project Integrated and Circular Technologies for Sustainable city region FOOD systems in Africa, InCiTis-Food).

REFERENCES

- [1] P. Chan, T.V. Gerven, J.L. Dubois, K. Bernaerts, "Study of motivation and engagement for chemical laboratory safety training with VR serious game" *Safety Science*, 167, 106278, pp. 1-13, 2023.
- [2] S. Bhide, R. Riad, L. Rabelo, J. Pastrana, A. Katsarsky, C. Ford, "Development of virtual reality environment for safety training", *IIE Annual Conference, Proceedings*, pp. 2302-2312, 2015.
- [3] E. Blair, D.-C. Seo, "Safety Training", *Prof Saf*, 52, 10, pp. 42-48, 2007.
- [4] K.P. Fivizzani, "The evolution of chemical safety training", *Chem Health Saf*, 12, pp. 11-15, 2005.
- [5] C. Abril, E.M. Gimenez-Fernandez, M. Camacho-Minano, "Using gamification to overcome innovation process challenges: A literature review and future agenda", *Technovation*, 133, 103020, pp. 1-17, 2024.

- [6] J. Högberg, M. Olsson Ramberg, A. Gustafsson, E. Wästlund, "Creating brand engagement through in-store gamified customer experiences", *Journal of Retailing and Consumer Services*, 50, pp. 122-130, 2019.
- [7] N.V. Wunderlich, A. Gustafsson, J. Hamari, P. Parvinen, A. Haff, "The great game of business: advancing knowledge on gamification in business contexts", *J. Bus. Res.*, 106, pp. 273-276, 2020.
- [8] J. Koivisto, J. Hamari, "The rise of motivational information systems: a review of gamification research", *Int. J. Inf. Manag.*, 45, pp. 191-210, 2019.
- [9] A. alsswey, M.Z. Malak, "Effect of using gamification of "Kahoot!" as a learning method on stress symptoms, anxiety symptoms, self-efficacy, and academic achievement among university students", *Learning and Motivation* 87, 101993, pp. 1-11, 2024.
- [10] R. Ciuchita, J. Heller, S. Kocher, T. Leclercq, K. Sidaoui, S. Stead, "It is really not a game: an integrative review of gamification for service research". *Journal of Service Research*, 26, 1, pp. 3-20, 2023.
- [11] C. Dichev, D. Dicheva, "Gamifying education: What is known, what is believed and what remains uncertain: a critical review" *International Journal of Educational Technology in Higher Education*, 14, 9, pp. 1-36, 2017.
- [12] K.A. Dell, D. M. DeVries, "Effect of changing multiple choice questions from "all of the above" to "select all that apply", *Currents in Pharmacy Teaching and Learning*, 16, pp. 174-177, 2024.
- [13] Trivial Pursuit board game, accessed 16 May, 2024. Retrieved from <https://www.paperzip.co.uk/trivial-pursuit-board-game/>.
- [14] InCiTiS-Food, accessed 16 May, 2024. Retrieved from <https://incitis-food.eu/>.