

# Evaluating three versions of an augmented reality mobile game about recycling.

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## Abstract

*We present three versions of an Augmented Reality (AR) game (basic, collaborative and competitive) for changing people attitudes with regard to climate change. We present a study in which twenty-eight primary school students have participated. To explore the extent to which the three AR game versions affected different aspects, the children had to answer questionnaires. The results did not show significant differences between the three versions. However, having into account the means and children preference, the competitive version could have had more influence on the participants.*

Categories and Subject Descriptors (according to ACM CCS): H.5.1 [Computer Graphics]: Multimedia Information Systems—Artificial, augmented, and virtual realities

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## 1. Description of the game

The main objective of the game was to increase users recycling awareness. The game consisted of putting objects in the corresponding recycling bins. There was one marker for rubbish objects and four markers for the recycling bins. The users had to focus with the phone camera on the corresponding markers to pick up an object or to place it in a recycling bin. During gameplay, questions related to recycling were asked to the player. Three versions of the game were implemented. In the basic version, only one user was allowed to play the game. In the collaborative version only one team could play the game. In the competitive version, teams competed against other teams.

## 2. Study

Twenty-eight children from 8 to 11 years old took part in the study. Participants in the trials used a Nokia N95 8Gb. Three questionnaires were used for the validation: a pretest, postgame test, and a final test. Questions were measured on a 7 point Likert scale. The children who participated in this study were randomly assigned and counterbalanced to one of the three following groups: A) basic-collaborative-competitive (order or play); B) collaborative-competitive-basic; C) competitive-basic-collaborative.

## 3. Results and conclusions

Multiple mixed design ANOVA analyses were performed to compare the three game versions. The results showed high scores on the different variables analyzed but no significant differences between the three game versions regarding the ease of use, the engagement, the perceived learning, the recycling attitudes and the intention to change. However, the competition version had greater means and was the most preferred version. These preliminary results could indicate that the competitive version motivated the players more than the other two versions.

Based on the advice of Gardner & Ashworth [GA08] that *if individuals also hold a positive attitude towards recycling they are more likely to actually perform the behaviour*, the results suggest that playing the game is likely to have some influence to change participants' behaviour, independent of the version used. Future research should be conducted at a later stage to confirm if players' actual recycling behaviour has been positively affected.

## References

[GA08] GARDNER J., ASHWORTH P.: Towards the intelligent grid: A review of the literature. In *Urban energy transition from fossil fuels to renewable power*, Droege P., (Ed.). Elsevier, 2008, ch. 12, pp. 283–307. 1