MEEGA+ Game Quality Scale: how to use?

The MEEGA+ scale aims to classify the evaluated game in a quality level, based on the students' perception, using the MEEGA+ measurement instrument.

The scale has been developed by adopting the statistical technique Item Response Theory (IRT), which allows to express through mathematical models the relationship between observable variables (questionnaire items) and latent traits (game's quality) based on the students' perceptions. The scale classifies the game's quality on three levels: low quality, good quality, and excellent quality.

The quality level of a game is determined based on the data collected using the MEEGA+ measurement instrument and analysing them through an R script which applies the defined scale scores in the collected data.

In order to classify the game using the MEEGA+ scale, it is necessary to follow these steps:

1. Download the files: it is necessary to download the files of the scale (available at: http://www.gqs.ufsc.br/meega-a-model-for-evaluating-educational-games/) and organize them into a single directory on your computer.

2. Prepare the files: Prepare an auxiliary file (named EXTRA) in csv (comma-separated values) extension with the data collected for the items (1, 5, 6, 7, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35). This file is an input for an R script which applies the defined scale scores in the data collected. This auxiliary file must be in the same directory that the other files.

3. Use RStudio: Using the statistical software RStudio (https://www.rstudio.com/), load the defined directory and execute the R script (SCRIPT_TRI_SCORE), which calculates the scores of the data collected, applying the Item Response Theory. As a result, on the console of the RStudio, the scores will be presented, and a new auxiliary file (SCORE_TRI_EXTRA.csv) will be generated in the directory, presenting the calculated scores and the standard error, as shown the Figure 1.

	A	B	C	D
1		ID	SCORE_TRI	ERRO_PADRAO_TRI
2	1	N1	-1,3648	0,6962
3	2	N2	-1,351	0,6132
4	3	N3	-0,8182	0,5252
5	4	N4	1,836	0,3176
6	5	N5	1,1933	0,3155

Figure 1. TRI scores

4. Analyse the scores and classifying the game: The Item Response Theory calculates the score (column SCORE_TRI) (in a (0,1) scale) of an individual and positions it on the defined scale. However, we are interested in the classification of the game (and not of an individual). Thus, we must calculate the average of the provided scores (column SCORE_TRI) of all participants that evaluated the game.

Based on the scores presented in Figure 1, the average for these scores is θ=-0.10. However, in order to provide a better understanding of these values, we transform this scores in a (50,15) scale, applying the following formula $\theta_{50,15}=50+15*\theta_{0,1}$. Thus, applying this formula in the average score we obtained a value of θ=48.5.

Based on this final value, we may classify the evaluated game in the MEEGA+ game scale. With a score of θ=48.5, this game is classified as a game with good quality (42.5 <= θ <

65). Therefore, this game typically presents the characteristics of its quality level, as described in Table 1.

Table 1. Game quality levels

Quality level	Level description
Low quality ($\theta < 42.5$)	At this level, the game rarely provides social interaction and hardly ever produces moments of fun among the players. The game does not capture the student's focused attention, does not arouse the confidence that he/she will learn from the game, nor does it produce feelings of satisfaction. The game rarely presents challenges, has monotonous tasks and does not contribute to student learning. Although a game at this level has a low relevance to the students' interests, a student recognizes that the game's content is related to the course. In terms of usability, a game at this level sometimes exhibits operability features, which may have some clear rules and be easy to play.
Good quality ($42.5 <= \theta < 65$)	At this level, the game sometimes presents challenging activities, offering new challenges for students. It provides moderately focused attention to the players, although students do not forget about their surroundings. Sometimes the game also provides feelings of confidence and satisfaction in the players. Frequently the game presents moments of social interaction and fun among the players. Often the game is considered relevant to the students' interests and, usually, the students recognize that the game's content is related to the course. Frequently the game contributes efficiently to student learning. In terms of usability, the game usually has the clear rules and is easy to play, although, usually does not present a fully attractive design.
Excellent quality ($\theta >= 65$)	At this level, the game is challenging for students and has no monotonous activities. It is highly relevant to students' interests and provides excellent focused attention, satisfaction, fun, and social interaction. It allows the student to be confident that he/she will learn from the game and contribute to and efficient student learning. In terms of usability, the game presents excellent operability and learnability, that is, it has clear rules and is easy to learn to play. Even so, a game at this level may present improvements in terms of aesthetics, not presenting a fully attractive design.