Statistical Analysis in the third study for students with effective participation

Table 1: Two-way ANOVA and Scheirer-Ray-Hare in the third study for students with effective participation

	Sum Sq	Df	F value	Pr(>F)	Sig	Df	Sum Sq	H	p.value	Sig
difScore.(Intercept)	1.938	1	0.281	0.599						
difScore.Type	92.005	1	13.340	0.001	**	1	1449.954	10.104	0.001	**
difScore.CLRole	45.461	1	6.592	0.014	*	1	730.485	5.090	0.024	*
difScore.Type:CLRole	0.013	1	0.002	0.965		1	5.159	0.036	0.850	
difScore.Residuals	255.178	37				37	3554.402			

Signif. codes: 0 “**” 0.01 “*” 0.05

Table 2: Summary of Tukey post-hoc in the third study for students with effective participation

	N	mean	lsmean	SE	df	lwr.CI	upr.CI	t.ratio	p.value	p.ajd	g
difScore.ont-gamified - w/o-gamified:ont-gamified - w/o-gamified	41	3.288	3.236	0.886		1.614	4.963	3.652	0.001	0.000	1.161
difScore.ont-gamified.Apprentice - w/o-gamified.Apprentice:ont-gamified.Apprentice - w/o-gamified.Apprentice	28	3.197	3.197	1.003		0.500	5.895	3.188	0.003	0.015	1.114

Table 3: Summary of Pair wilcoxon in the third study for students with effective participation

	Group	N	Median	Mean.Ranks	Sum.Ranks	U	Z	p.value	r	magnitude
difScore.Type.greater.1	ont-gamified	23	2.24	26.26	604	328	3.18	0.001	0.496	medium
difScore.Type.greater.2	w/o-gamified	18	−1.15	14.28	257	328	3.18	0.001	0.496	medium
difScore.Type.two.sided.1	ont-gamified	23	2.24	26.26	604	328	3.18	0.001	0.496	medium
difScore.Type.two.sided.2	w/o-gamified	18	−1.15	14.28	257	328	3.18	0.001	0.496	medium
difScore.Type:CLRole.greater.1	ont-gamified.Apprentice	16	2.58	18.12	290	154	2.69	0.003	0.509	large
difScore.Type:CLRole.greater.2	w/o-gamified.Apprentice	12	−0.60	9.67	116	154	2.69	0.003	0.509	large
difScore.Type:CLRole.two.sided.1	ont-gamified.Apprentice	16	2.58	18.12	290	154	2.69	0.006	0.509	large
difScore.Type:CLRole.two.sided.2	w/o-gamified.Apprentice	12	−0.60	9.67	116	154	2.69	0.006	0.509	large
difScore.Type:CLRole.greater.11	ont-gamified.Apprentice	16	2.58	14.19	227	91	3.17	0.000	0.676	large
difScore.Type:CLRole.greater.21	w/o-gamified.Master	6	−3.31	4.33	26	91	3.17	0.000	0.676	large
difScore.Type:CLRole.two.sided.11	ont-gamified.Apprentice	16	2.58	14.19	227	91	3.17	0.001	0.676	large
difScore.Type:CLRole.two.sided.21	w/o-gamified.Master	6	−3.31	4.33	26	91	3.17	0.001	0.676	large
difScore.Type:CLRole.greater.12	ont-gamified.Master	7	1.06	9.29	65	37	2.29	0.011	0.634	large
difScore.Type:CLRole.greater.22	w/o-gamified.Master	6	−3.31	4.33	26	37	2.29	0.011	0.634	large
difScore.Type:CLRole.two.sided.12	ont-gamified.Master	7	1.06	9.29	65	37	2.29	0.022	0.634	large
difScore.Type:CLRole.two.sided.22	w/o-gamified.Master	6	−3.31	4.33	26	37	2.29	0.022	0.634	large
difScore.Type:CLRole.greater.13	w/o-gamified.Apprentice	12	−0.60	11.25	135	57	1.97	0.026	0.464	medium
difScore.Type:CLRole.greater.23	w/o-gamified.Master	6	−3.31	6.00	36	57	1.97	0.026	0.464	medium

1 Assumptions for Parametric Tests

Table 4: Univariate normality test in the third study for students with effective participation

	normality.fail	W	p.value
difScore	FALSE	0.985	0.85

Table 5: Notes to be taken into account about sample size in the third study for students with effective participation

	code	description
difScore.Type.1	WARN: sample.size	current size is 12 and recommended size is 15 for the group: 'w/o-gamified:Apprentice'.
difScore.Type.2	WARN: sample.size	current size is 7 and recommended size is 15 for the group: 'ont-gamified:Master'.
difScore.Type.3	WARN: sample.size	current size is 6 and recommended size is 15 for the group: 'w/o-gamified:Master'.

Recent studies carried out through simulations have indicated that ANOVA is reliable even when the data are non-normally distributed and the sample size is greater thatn 15 observations for each group. This size value is based on the Reference: Rana, R. K., Singhal, R., & Dua, P. (2016). Deciphering the dilemma of parametric and nonparametric tests. Journal of the Practice of Cardiovascular Sciences, 2(2), 95.

The sample size to carried out any parametric and non-parametric analysis is 5, and it was established using common sense. The warning and fails indicated in this section should be taking into account when a paper or report will be elaborated.