The Effect of Gamified Teamwork on Team Members' Engagement

An Experiment on Idea Generation

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***Abstract*—A new method supposed to increase team members' engagement during teamwork is gamification. Due to the novelty of gamification, its possible effects on team members' engagement were not fully investigated yet. The present study aims to reduce this research gap and to test an assumption based on flow theory that gamified teamwork increases participant's engagement. Engagement was operationalized as the speaking time and the turn-taking frequency during a discussion. 139 students divided in 57 teams were asked to imagine themselves to be a management team of a young, innovative enterprise. 29 teams were randomly assigned to the experimental and the rest to the control condition. All teams completed the task to generate solutions for the problems presented in a case study, while their discussion has been recorded. Surprisingly, no differences in engagement were found between the experimental and the control condition. The findings and limitations are discussed.**

Keywords—engagement; gamification; idea generation; innovation; teamwork

I. INTRODUCTION

Increasing team members' or employees' engagement is an important goal of many organizations [1] including young, innovative enterprises [2]. Engagement is considered to be a state in which individuals "express themselves physically, cognitively, and emotionally during role performance" [3, p. 694]. In business practice, employees' engagement is positively linked to employees' performance [4] und results in commercial advantages for employers [1], [5] such as revenue growth, decrease in operating expenses, high customer satisfaction [6] and good service climate [7]. Employees' engagement is also necessary for participation at innovation development in a team [8]. This is especially relevant for young, innovative enterprises. Since innovation development requires a lot of effort and time and teams in young, innovative enterprises are usually small [9], engagement of every single team member is a necessary precondition for success [10].

A new phenomenon that can increase participants' engagement by making their tasks more enjoyable is gamification [11] - [14]. Gamification is the use of game design elements like points, badges, and leaderboards known from sports, tabletop or video games in non-game contexts [12], [15]. Therefore, gamified teamwork is teamwork complemented with game design elements in non-game contexts. Such game design elements (also called "gamification mechanics") were never used as widely as it is done today [16], [17].

Although some scholars are concerned about possible negative effects of gamification like extreme competitiveness among participants [18] or negative gamification perception by elder participants [19] the majority of reported effects is positive (see [12] for a review). In particular, gamification was shown to have positive emotional and behavioral effects like high task enjoyment, better learning outcomes, better health behavior etc. [12], [20], [21]. Gamification also helped teams to generate promising new ideas that then built a basis of an innovative product [22], [23]. In a previous study it could be shown that in gamified teamwork participants generate more ideas and more original ideas than in non-gamified teamwork [24].

Due to its novelty, gamification and gamified teamwork still lack differentiated research. In their review, [25] criticize published studies because of methodological constraints such as small samples, no control conditions or results limited to descriptive statistics and participants' subjective evaluation. For this reason, it is still doubtful that the reported positive effect of gamification on participants' engagement is indeed robust.

The present study was designed to overcome these shortcomings in a controlled experiment using psychometric as well as behavioral measurements. It aims to analyze whether gamified teamwork for idea generation has an effect on team members' engagement in the context of a young, innovative enterprise. By examining this question, the study contributes to existing research in two ways. First, the study takes a differentiated view on possible effects of gamified teamwork for idea generation on participants' engagement and links them to a theoretical framework. Thereby it extends the existing gamification research. Second, for implementation of gamified teamwork for idea generation in business practice it is necessary to know whether it accomplishes the goal to increase employees' engagement. The study allows to answer this question and to derive practical implications from the findings.

The present study is based on flow theory [26], which is described below. After deriving the hypotheses from the theory,

applied method will be shortly presented (see [24], p. 25-27 for more information) and details about hypotheses testing will be provided. At the end the findings, study implications and limitations will be discussed.

II. Theoretical Background and Hypotheses

A. Young, innovative enterprises

A "young enterprise" (or a "new venture" or "new firm") can be defined in various ways. The cut-off criteria used in previous research range between the maximum age of six years [27] and 12 years [28]. In theoretically grounded research and applied science the criterion of maximum ten years is widely applied [9], [29]. The case study developed for the present experiment focuses on an enterprise that was found eight years ago and therefore is included in the range mentioned above. Although there are some prominent exceptions, the majority of young enterprises is small regarding both revenue and number of employees [9], [30] and suffer from a lack of resources [31], [32].

Enterprises that assess their products or services as novel in either the international or regional market are considered to be innovative [9]. Innovation is "the multi-stage process whereby organizations transform ideas into new/improved products, service or processes" [33, p. 1334]. Since innovation provides a crucial competitive advantage to an enterprise, innovation development is an especially important task of young enterprises striving to establish their products or services in the market.

B. Team and Teamwork

Building on the previous research, [34, p. 241] defined team as "a collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems (for example, business unit or the corporation), and who manage their relationships across organizational boundaries". The term "team" is often used as a synonym for a "group" that is not linked to any size limitation [35], therefore dyads and triads also are considered to be teams [36]. This is relevant for young, innovative enterprises, since entrepreneurial teams typically consist of two to three persons [9].

Teamwork implies more than just the collaborative solution of tasks. It includes the thoughts, feelings, and behaviors of team members as they interact in pursuing a common goal [37]. Innovation-related teamwork is especially complex and requires well-coordinated communication, high effort and well-balanced contributions of all team members [38].

C. Flow Theory

Flow theory [26] was applied in gamification research in order to explain possible positive effects of gamification on participants [39] - [41]. The flow is an "optimal experience" that is associated with immersion into an interesting activity, happiness and enjoyment [26, p. 24]. It usually occurs when a person focuses on the relevant, well-structured activity with clear goals, feels that this activity is mainly under her/his own control, and is neither overwhelmed nor bored because there is "a balance between the challenges perceived in a given situation and the skills a person brings to it" [26, p. 32].

All these preconditions are fulfilled by gamified teamwork for idea generation as it is described in previous studies [22], [42]: there are a well-structured activity such as an online game following certain rules, a clear goal to generate a large number of new ideas, the control of own actions within the game etc. The players voluntary participated in gamified teamwork for idea generation, which means that the perceived challenges and the skills to meet them were well-balanced, otherwise the players would cancel their participation. It is therefore plausible to assume that gamification increases the flow of participants. The previous gamification research provides empirical evidence for this assumption [43], [44]. Consistent with these findings, following hypothesis was derived for the present study:

H1: In gamified teamwork, team members' report higher flow experience than in non-gamified teamwork.

D. Engagement

The flow is per definition linked to engagement, since it is impossible to experience the flow without immersing into the certain activity [26]. Engagement is defined as a condition in which people "express themselves physically, cognitively, and emotionally during role performance" [3, p. 694]. It includes involvement, commitment, passion, and focused effort [45]. Although this definition is similar to the definition of the term "motivation" [45], there is a critical difference between these concepts [3], [46]. Motivation is "a desire to be involved" [47, p. 263] and therefore a premise for engagement [3] that is "cognitive and affective participation" [47, p. 263]. Engagement leads to measurable results such as achievement [46] and can be observed on the behavioral level [48].

In the context of innovation development in teams it is of primary interest, whether the team members are indeed engaged in teamwork for innovation, since real engagement and not the mere wish to be engaged leads to successful development of new products or services [49]. For this reason, the present study focuses on team members' engagement rather than on their motivation. Since the definition of engagement refers to behavior [47], engagement can be operationalized by behavioral variables.

Surprisingly, the previous gamification research was dominated by the self-reported measurements of participants' engagement in gamified tasks, e.g. [20], [50]. Such self-reported measurements have some general methodological restrictions regarding their objectivity, reliability, and validity [51], which may be reduced by using behavioral measurements. For this reason, in the present study the behavioral measurements such as speaking time and the turn-taking frequency during the discussion were applied. Extended amount of speaking time is linked to high personal engagement and interest in a discussion topic [52].

Turn-taking is one of the basic elements of interpersonal communication that allows smooth information exchange and avoids that a single participant dominates the conversation completely [53], [54]. If all team members are highly engaged, their discussion will be characterized by a high turn-taking frequency [55], [56]. In contrary, if one engaged team member dominates the entire discussion and suppresses her/his less

engaged team members or all team members are silent, the turn-taking frequency is expected to be low [57]. Thus:

H2: In gamified teamwork, team members' speaking time during a discussion is longer than in non-gamified teamwork.

H3: In gamified teamwork, turn-taking frequency within a team during a discussion is higher than in non-gamified teamwork.

III. METHOD

A. Participants

175 university students were recruited. They divided themselves in 72 teams of two or three persons. Written informed consent was obtained from each participant. A pilot team consisted of two persons whose data were not included into the analysis. One participant did not fill out 27.6% of the questionnaire, therefore his team consisting of three persons was post hoc excluded from the data analysis. The data of further 13 teams were eliminated because of defect video recordings.

The data of the remaining 139 students (72.7% female) in 57 teams were analyzed. 32 teams consisted of two participants each, 25 teams consisted of three participants each. 28 teams consisted of female members only, 24 teams were mixed and 5 teams consisted of male members only. 29 teams were randomly assigned to the experimental and the other 28 teams to the control condition. Participants ranged in age from 18 to 38 years ($M = 22.42$, $SD = 3.91$). All participants could choose either a monetary reward of 20 euro or a formal confirmation of their participation needed by psychology students for their diploma.

B. Materials and Apparatus

All written materials were in German. A case study that was developed especially for the present study followed an example used in assessment centers [58]. A standard solution consisted of ten ideas and was validated by comparing it to the results of a pilot group. A paper-pencil questionnaire included demographic items and scales listed in Table I.

TABLE I. CONSTRUCTS, APPLIED SCALES AND THEIR RELIABILITY COEFFICIENTS (CF. [24])

Construct	Scale	Cronbach's α
Personality traits	Big Five Inventory, short version [59]	.72
Locus control	Internal and external locus control [60]	[.58; .71]
Risk/sensation seeking	German Arnett Inventory of Sensation Seeking, short version [61]	[.49; .66]
Entrepreneurial intention	Entrepreneurial intention scale [62]	0.97
Flow	Short flow scale [63]	[.80; .92]
Feedback	Feedback scale developed for the present study	.82

In the experimental condition, blank paper moderation cards were used. Moderation cards with a thumbs-up symbol were applied as a badge "idea generator". A laptop with a blank text file was provided in both conditions. A microphone and a digital video camera were used to record each discussion.

C. Study Design

The present study was designed as a single factor between-participant experiment. As the **independent variable** the experimental condition with levels gamified teamwork (experimental condition) and NGT (control condition) was applied.

As the **dependent variables** the team members' (1) flow scores measured by the short flow scale [63], (2) team members' speaking time in seconds during the discussion and (3) the turn-taking frequency within a team during a discussion were applied. Speaking time and the turn-taking frequency were calculated based on the modified open-source python library by [64]. A higher number implies more engagement of team members than a lower number does.

The **covariats** were (1) age of team members, (2) sex of team members or sex composition of the team since men tend to interrupt their conversation partners more often than women [65], (3) gaming time of team members (h/week), (4) team size, (5) relationship duration (months) within the team, and (6) extraversion of team members. Highly extraverted individuals tend to speak more because of the higher sociability [66] than less extraverted individuals do. If a team consists of highly extraverted individuals, their turn-taking frequency is expected to be higher than if team members are less extraverted [67]. Although extraversion is an individual characteristic of a person, the mean of team members' extraversion scores is a well-established measurement in group research [68].

D. Procedure

All participants received written instructions. Only one team was tested at a time. An experimenter handed out the questionnaire randomly either before or after the case study to each participant. All experiment phases are shown in Figure 1.

In the gamified teamwork, the experimenter presented a leaderboard that consisted of moderation cards with one of the five best-performing teams on each card and points they achieved in ascending order (s. Figure 2). S/he informed the participants that their team also can be placed at the leaderboard. Then the participants were asked to follow the opening gamification ritual recommended by [21] for creative tasks, i.e. to hold their palms up for 15 seconds. This position positively impacts the attitude towards new stimuli due to its evolutionary old association with an open mind: while receiving something, people hold their hands up, while holding the palms down is a rejection gesture [21], [69].

Then the work on the case study began. It consisted of three main phases following the NGT structure [70], [71]: (1) individual work without any exchange with other team members that was limited to 25 minutes, (2) notation of all ideas in a blank file visible for all team members and (3) discussion about the ideas within the team that was video recorded and limited to 20 minutes.

After the phase 1 the experimenter assigned one point to every idea generated by a participant. Each participant received

a moderation card with his/her number of points. If a participant generated more than 8 ideas, s/he also received a badge "idea generator" (s. Figure 2). These data functioned only as a feedback for the participants and were not included into further data analysis.

In phase 2 participants noted one of their ideas per turn in a blank file visible for all team members. They were not allowed to discuss their ideas in this phase.

The video recorded discussion limited to 20 minutes took place in phase 3. Then the experimenter evaluated the generated ideas. The team received one point for ideas that were included into the standard solution and two points for ideas that were not included into the standard solution, since the latter ones were evaluated as more original. If the team achieved more points than any of the teams at the leaderboard, it replaced the team that scored lower. These data also functioned only as a feedback for the participants and were not included into further data analysis. Finally, each participant filled out the feedback scale.

In the control condition the opening ritual, points, badges and leaderboard were not used. All other instructions as well as the case study materials were identical to the experimental condition.

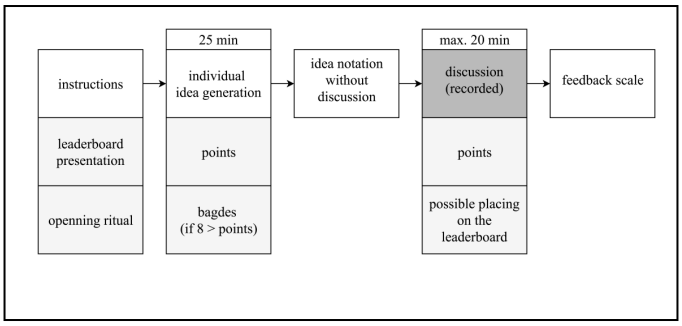

Fig. 1. Experimental phases (cf. [24], p. 27). Light grey rectangles represent gamification mechanics which are relevant for the gamification condition only. The dark grey rectangle illustrates the discussion phase which was video recorded and is critical for the present study. The questionnaire was handed out randomly either before or after the case study and is not shown here.

IV. Results

A. Missing Values

Each questionnaire item was on average missed by 0.3% of the participants (min = 0%, max = 2.3%). No missing data patterns were detected, therefore the missing values were considered to be missing at random and were substituted by the relevant means.

B. The Flow

Table II and Table III show descriptive statistics and correlation coefficients for variables on the individual level. The contingency between the sex of the participant and the experimental condition was not significant, Cramer's V = 0.17, p = .05.

A stepwise regression analysis was conducted to test H1. No violation of normality assumption (W(139) = 0.99, p = .25) and no severe violations of the assumptions of linearity, homoscedasticity and absence of multicollinearity were found. As shown in Table IV, Model 1 consisted of the covariats only. Since there is no evidence that the flow experience is linked to personality traits, Extraversion was not included into the covariats list. Model 1 did not explain a significant amount of variance in the flow scores of the team members. In Model 2 the experimental condition was added. The increase in variance explained by the predictors over Model 1 was not statistically significant.

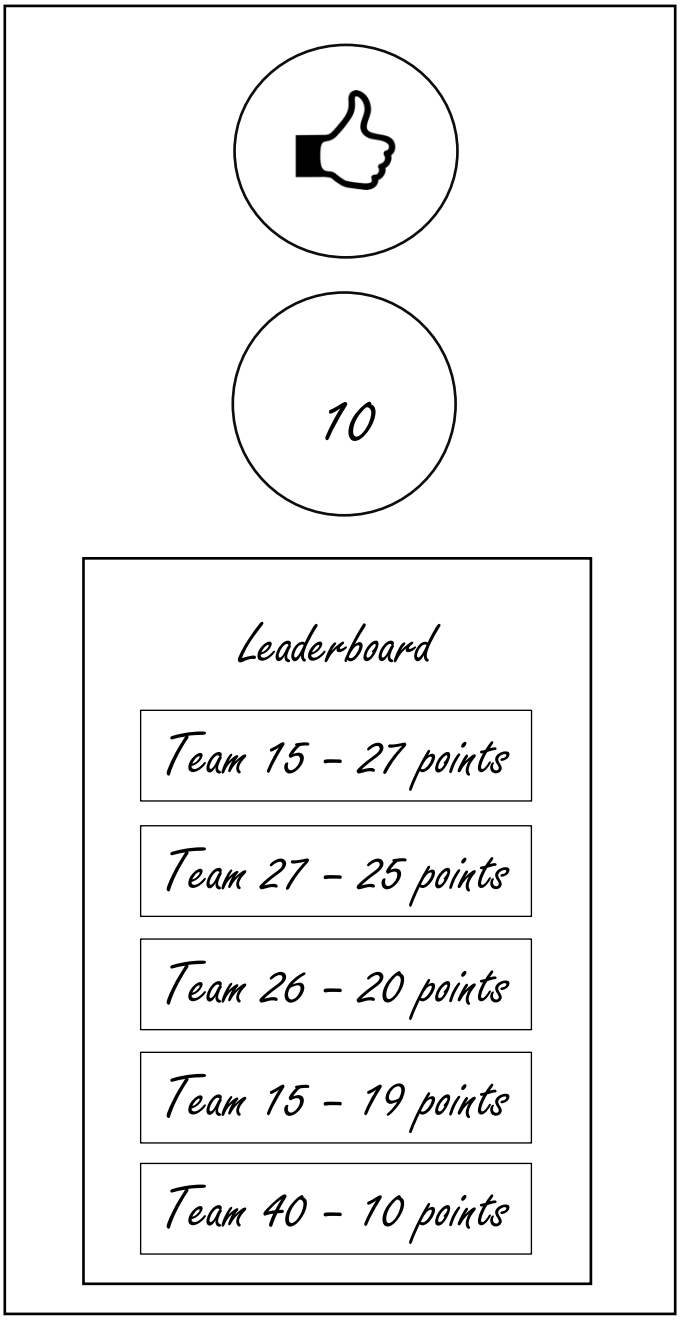

Fig. 2. Examples for gamification elements used in the experiment [24]: a card with a thumbs-up symbol for the badge "idea generator", a card with a number of points achieved by a team member and a leaderboard.

TABLE II. DESCRIPTIVE STATISTICS AND PEARSON CORRELATIONS OF THE DEPENDENT VARIABLES AND COVARIATS ON THE INDIVIDUAL LEVEL

	Variables (individual level)	M	SD	1.	2.	3.	4.	5.	6.
1.	Speaking time (s)	312.12	112.57						
2.	Flow	4.95	0.88	.19*					
3.	Age (years)	22.42	3.92	-.01	-.03				
4.	Gaming time (h/week)	3.02	5.00	.05	.04	-.01			
5.	Team size	2.54	0.5	-.53**	-.05	-.15	.06		
6.	Relationship duration (months)	22.85	41.82	.06	.16	.09	.12	-.21*	
7.	Extraversion	3.49	0.87	.17*	.06	-.07	-.10	-.03	-.20*

Note: n = 139; s = seconds; h/week = hours per week; **p < .01; * p < .05.

TABLE III. CORRELATION COEFFICIENTS OF THE NOMINAL VARIABLES "SEX COMPOSITION OF A TEAM" (MEN VS. WOMEN VS. MIXED TEAMS) AND "EXPERIMENTAL CONDITION" (GAMIFICATION VS. CONTROL CONDITION) AND RATIO VARIABLES ON THE INDIVIDUAL LEVEL

Variables (individual level)	Sex of the participant[a]		Experimental condition[b]	
	η	η^2	η	η^2
Speaking time (s)	.19	.04	.12	.01
Flow	.10	.01	.07	.00
Age (years)	.20	.04	.00	.00
Gaming time (h/week)	.38	.14	.11	.01
Team size	.08	.01	.12	.01
Relationship duration (months)	.18	.03	.16	.03
Extraversion	.01	.00	.04	.00

Note: n = 139; η^2 = amount of explained variance; s = seconds; h/week = hours per week.

[a] when mixed team = 1, when female members = 2, when male members = 3

[b] when control condition = 1, when gamification condition = 2

TABLE IV. COEFFICIENTS OF REGRESSION ANALYSIS – THE FLOW SCORES OF THE TEAM MEMBERS

Regression statistics	Model 1			Model 2		
df	5			6		
R^2	.02			.02		
Adjusted R^2	-.02			-.03		
F	0.43			0.40		
ΔR^2	.02			.00		
ΔF	0.43			0.27		
f^2	0.02			0.02		
Variables	B	SE	β	B	SE	β
Constant	5.84***	0.87		5.68***	0.93	
Age (years)	-0.01	0.02	-.06	-0.01	0.02	-.06
Sex[a]	-0.21	0.19	-.11	-0.20	0.19	-.10
Gaming time (h/week)	0.00	0.02	.00	0.00	0.02	.00
Team size	-0.09	0.16	-.05	-0.08	0.16	-.05
Relationship duration (months)	0.01	0.10	.01	0.00	0.10	.00
Experimental condition[b]				0.08	0.16	.05

Note: n = 139; df = degree of freedom; R^2 = amount of explained variance; f^2 = effect size; h/week = hours per week; *** p < .001.

[a] when mixed team = 1, when female members = 2, when male members = 3

[b] when control condition = 1, when gamification condition = 2

C. Speaking Time

An equivalent stepwise regression analysis was conducted to test H2 (see Table II and Table III for descriptive statistics and correlation coefficients). No violation of normality assumption ($W(139) = 0.99$, $p = .34$) and no severe violations of the assumptions of linearity, homoscedasticity and absence of multicollinearity were found.

Model 1 consisted of the covariats only and explained a significant amount of variance in speaking times of the team members (s. Table 5). It had three significant predictors: sex of the team member ($\beta = -.15$, $t(132) = -1.84$, $p < .10$), team size ($\beta = -.51$, $t(132) = -6.68$, $p < .001$) and Extraversion ($\beta = .14$, $t(132) = 1.97$, $p < .10$). The maximum VIF value in Model 1 was 1.27. In Model 2 the experimental condition was added. The increase in variance explained by the predictors over Model 1 was not statistically significant.

TABLE V. COEFFICIENTS OF REGRESSION ANALYSIS – SPEAKING TIME (IN SECONDS) OF THE TEAM MEMBERS

Regression statistics	**Model 1**			**Model 2**		
df	6			7		
R^2	.34			.34		
Adjusted R^2	.31			.31		
F	11.33***			9.66***		
ΔR^2	.34			.00		
ΔF	11.33***			0.12		
f^2	0.52			0.52		
Variables	B	SE	β	B	SE	β
Constant	649.65***	96.52		638.14***	102.62	
Age (years)	-2.69	2.20	-.09	-2.67	2.21	-.09
Sex[a]	-36.74*	20.00	-.15	-35.93*	20.21	-.14
Gaming time (h/week)	0.79	1.74	.04	0.75	1.75	.03
Team size	-114.41***	17.12	-.51	-113.92***	17.24	-.51
Relationship duration (months)	8.44	10.76	.06	8.07	10.85	.06
Extraversion	18.59*	9.43	.14	18.80*	9.48	.15
Experimental condition[b]				5.55	16.38	.03

Note: n = 139; df = degree of freedom; R^2 = amount of explained variance; f^2 = effect size; h/week = hours per week; ***p < .001; *p < .10.

[a.] when male = 1, when female = 2

[b.] when control condition = 1, when gamification condition = 2

D. The Turn-taking Frequency

Table VI and Table VII show descriptive statistics and correlation coefficients on the team level. The contingency between the sex composition of the team and the experimental condition was not significant, Cramer's $V = 0.22$, $p < .05$.

A stepwise regression analysis that employed variables on the team level was conducted to test H3. No violation of normality assumption ($W(57) = 0.98$, $p = .53$) and no severe violations of the assumptions of linearity, homoscedasticity and absence of multicollinearity were found.

Model 1 consisted of the covariats only and explained a significant amount of variance in the turn-taking frequency of the teams (s. Table VIII). The only significant predictor was team size ($\beta = .41$, $t(50) = 3.26$, $p < .01$). The maximum VIF value in Model 1 was 1.17. In Model 2 the experimental condition was added. The increase in variance explained by the predictors over Model 1 was not statistically significant.

TABLE VI. DESCRIPTIVE STATISTICS AND PEARSON CORRELATIONS OF THE DEPENDENT VARIABLES AND COVARIATS ON THE TEAM LEVEL

	Variables (team level)	**M**	**SD**	**1.**	**2.**	**3.**	**4.**	**5.**
1.	Turn-taking frequency	86.40	31.61					
2.	Mean age (years)	22.54	3.43	-.28*				
3.	Mean gaming time (h/week)	2.96	3.94	-.07	-.07			
4.	Team size	2.44	0.50	.42**	-.17	.07		
5.	Relationship duration (months)	24.80	43.75	-.02	.11	.13	-.20	
6.	Mean Extraversion	3.49	0.65	.00	-.18	-.20	-.03	-.25

Note: n = 57; h/week = hours per week; **p < .01; *p < .05.

TABLE VII. CORRELATION COEFFICIENTS OF THE NOMINAL VARIABLES "SEX COMPOSITION OF A TEAM" (MEN VS. WOMEN VS. MIXED TEAMS) AND "EXPERIMENTAL CONDITION" (GAMIFICATION VS. CONTROL CONDITION) AND RATIO VARIABLES ON THE TEAM LEVEL

Variables (team level)	**Sex composition of the team[a]**		**Experimental condition[b]**	
	η	η^2	η	η^2
Turn-taking frequency	.35	.12	.08	.01
Mean age (years)	.25	.06	.01	.00
Mean gaming time (h/week)	.26	.07	.11	.01
Team size	.05	.00	.12	.01
Relationship duration (months)	.18	.03	.20	.04
Mean Extraversion	.14	.02	.02	.00

Note: n = 57; η^2 = amount of explained variance; h/week = hours per week.

[a.] when mixed team = 1, when female members = 2, when male members = 3

[b.] when control condition = 1, when gamification condition = 2

TABLE VIII. COEFFICIENTS OF REGRESSION ANALYSIS – TURN-TAKING FREQUENCY

Regression statistics	Model 1			Model 2		
df	6			7		
R^2	.28			.29		
Adjusted R^2	.19			.19		
F	3.17*			2.85*		
ΔR^2	.28			.01		
ΔF	3.17*			0.98		
f^2	.39			.41		
Variables	B	SE	β	B	SE	β
Constant	50.87	49.91		38.53	51.46	
Mean age (years)	-1.72	1.20	-.19	-1.69	1.20	-.18
Sex composition of the team[a]	8.95	6.26	.18	8.78	6.27	.18
Mean gaming time (h/week)	-0.91	1.01	-.11	-1.01	1.01	-.13
Team size	25.81**	7.93	.41	26.56**	7.96	.42
Relationship duration (months)	0.06	0.09	.08	0.04	0.09	.06
Mean Extraversion	-0.67	6.30	-.01	-0.89	6.31	-.02
Experimental condition[b]				7.69	7.78	.12

Note: n = 57; df = degree of freedom; R^2 = amount of explained variance; f^2 = effect size; [a]when mixed team = 1, when female members = 2, when male members = 3; [b]when control condition = 1, when gamification condition = 2; h/week = hours per week; **p < .01; *p < .05.

V. CONCLUSIONS

A. Discussion of the Results

The results do not support H1, since there was no significant effect of gamified teamwork on the flow scores of the participants. The mean flow score of the participants and its standard deviation was very close to the equivalent data reported by [63] for diverse "immersive" activities. In other words, the mean flow score of the participants in the present study was comparatively high, by disregarding the experimental conditions. It may be assumed, that the comparatively high mean flow score of the participants resulted from the recruiting strategy, since only interested students applied for the participation in the experiment.

H2 and H3 must also be rejected, because no effect of gamified teamwork on speaking time or the turn-taking frequency could be detected. In the terms of flow theory, the flow leads to the performance [72]. Regarding the similar flow scores in both conditions, it is not surprising that there is also no difference on the behavioral level between the gamified and non-gamified teamwork.

Although the most gamification studies reported increased engagement of the participants by gamification [11] - [14], argue that the effect of gamification on participants' engagement can depend on "the nature of the gamified system". Under this premise, it may be concluded that the applied gamification mechanics and the way they were used in the present study were not appropriate for increasing participants' engagement.

B. Limitations and Further Research

The inconclusive findings regarding the effects of gamified teamwork and numerous ways to use it for idea generation create nearly unlimited possibilities for future research. The limitations of the present study may serve as the starting point for design of new studies.

The first constraint of the present study that has to be mentioned is the recruited sample. Although the sample size used for the present study is relatively large in comparison to previous studies on gamification [12], the results of the regression analyses show that it may be not large enough to find a possible small-sized effect.

A small team size also does not allow any conclusions about the effect of gamified teamwork on engagement within larger teams consisting of four or more members. For these reasons, a similar follow-up experiment with a higher number of participants in total and a larger team size may be conducted to test this assumption.

The second limitation of the present study is the fact that the recording equipment (i.e., a video camera and a microphone) was placed in front of the team members and was visible for them during the whole experiment. The team members were therefore permanently aware that they were observed, which probably influenced their behavior [73]. It is plausible to assume that the team members in both experimental conditions were equally engaged because they felt observed and not because of the applied procedure [74]. Hidden recording equipment is recommended for future research since it allow the participants to forget about the observation and to behave naturally.

The third aspect which may be varied in the future research is the operationalization of team members' engagement. In the present study, psychometric and behavioral measurements were applied based on previous research [26], [52]. Since engagement was shown to correlate positively with the participants' performance [4], using a performance measurement as a practically relevant proxy variable for participants' engagement also can be of interest. For example, a number of ideas generated by every participant during the individual idea generation may serve as such measurement.

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