

Supplementary Materials: Factors to consider for Tailored Gamification

Author 1 et al.

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1 Participant instructions

Participants were presented with the instructions shown in figure 1. The link provided redirected participants to the profile questionnaire which was hosted on the *google forms* platform. The participants were shown pairs of storyboards and asked **Which situation would motivate you more to use the system?** (as shown in figure 2).

Game Element Preference Survey

Instructions -

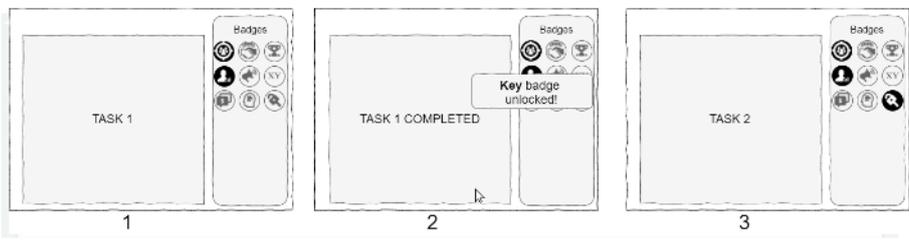
Presentation:

The aim of our work is to motivate users to complete tasks in a system. This survey will help us to understand what types of motivators different types of users prefer.

In the following survey, you will be presented with a set of storyboards that show a system that uses various types of motivators.

The system could be for example an app that helps you learn a new language where the tasks are different vocabulary exercises. The motivators could be a badge that is given to the user for completing tasks, or a timer that incites users to complete each task faster than the last. Each storyboard presents a situation where a given motivator is proposed.

Example:



The example shows three storyboard panels labeled 1, 2, and 3. Panel 1 shows a task area labeled 'TASK 1' and a 'Badges' sidebar with several icons. Panel 2 shows the task area labeled 'TASK 1 COMPLETED' and a tooltip that says 'Key badge unlocked!' pointing to a key icon in the 'Badges' sidebar. Panel 3 shows a task area labeled 'TASK 2' and the same 'Badges' sidebar.

In this situation, after completing a task, the user is rewarded with the "Key" badge (motivator).

Instructions:

You will be presented with pairs of storyboards. For each pair of storyboards, we ask you to choose the one that you would personally find motivating.

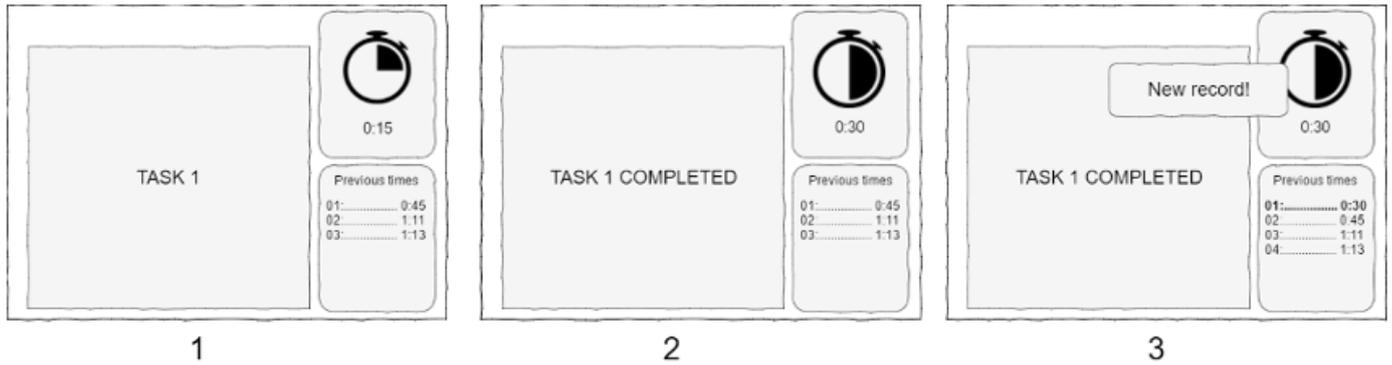
Before completing the survey please fill out the other questionnaire [here](#) and provide your Figure Eight contributor ID at the end to receive the full payment. This step should take between 4 and 5 minutes to complete.

If the link provided doesn't work, please paste the following into a new browser page : <https://goo.gl/forms/KfHGnsW4sVSsyj8I3>.

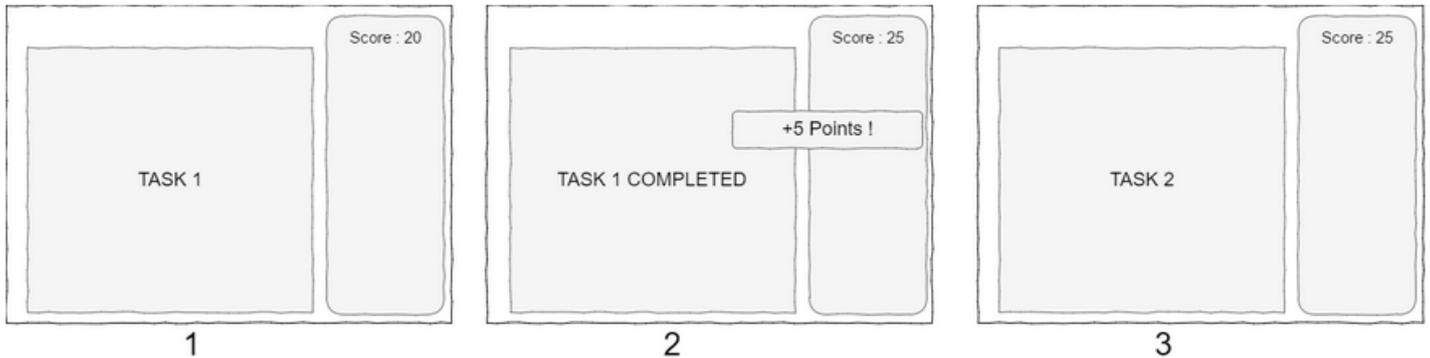
You can find your Contributor ID by clicking on the "help" button in the upper tool bar.

Figure 1: Participant instructions

Situation 1:



Situation 2:



Which situation would motivate you more to use the system? (required)

Situation 1

Situation 2

Figure 2: An example of one of the pairs shown to participants, in this case the Timer and Points game elements were compared.

2 Storyboards used to present each game element.

The following figures show the storyboards used to represent our game elements. Each storyboard illustrates a user completing various generic tasks.

2.1 Rewards

These storyboards represent the three game elements that implement the Rewards motivational strategy. In the Points storyboard (fig. 3), the user receives points each time he/she completes a task. The panel on the right shows how many points the user has accumulated. In the Badges storyboard (fig. 4), the user gains a badge for completing the task. The panel on the right shows the user which badges he/she has unlocked (in black) and which badges he/she has not unlocked yet (in grey). The Useful Rewards storyboard (fig. 5) shows the user completing a task and receiving a "Give example" item. This can be used to show the user an example to help him/her complete tasks.

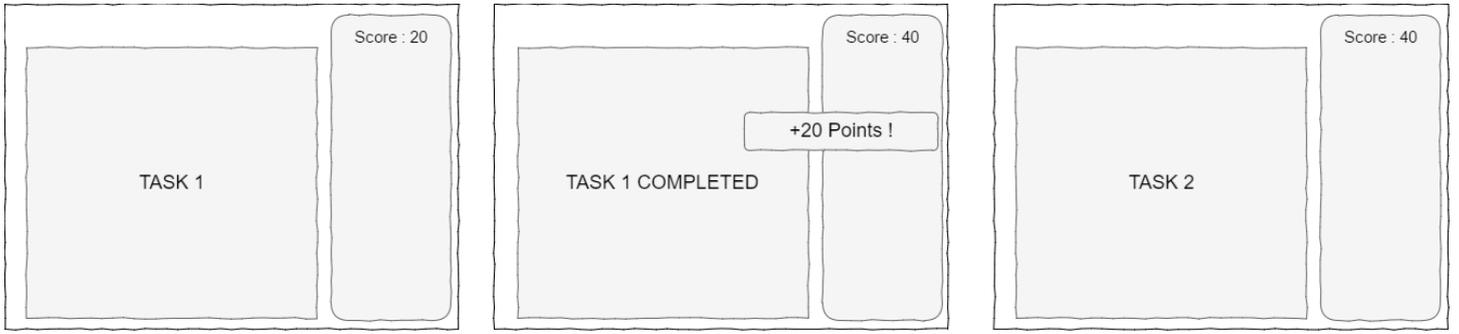


Figure 3: The Points storyboard.



Figure 4: The Badges storyboard.

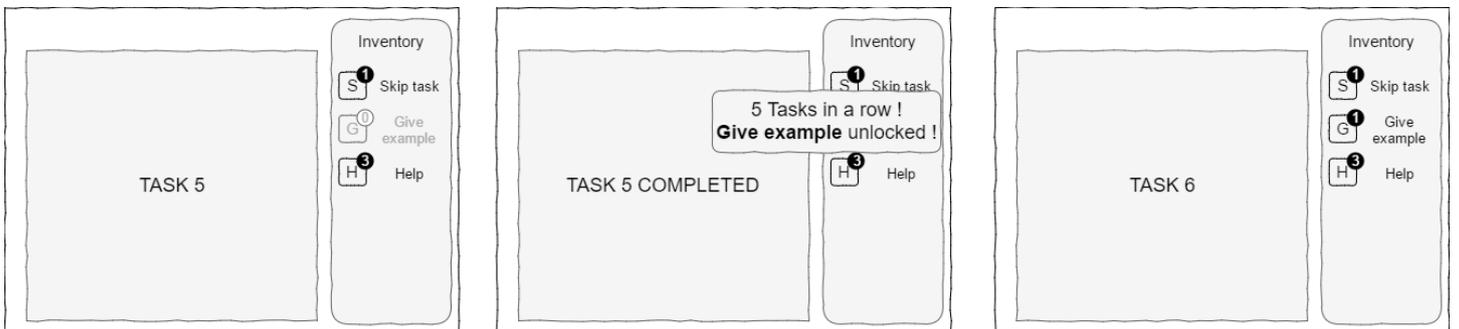


Figure 5: The Useful Rewards storyboard.

2.2 Goals

These storyboards show the two game elements corresponding to the Goals motivational strategy. In the External Goals storyboard (fig. 6) the user completes a task, and is given a new goal by the system. On the right the user can see what goals he/she currently has, and can track which are completed. For the Self Goals storyboard (fig. 7), the user can click on a button in the right panel to open an interface that lets them add a new goal. The panel on the right shows completed goals.

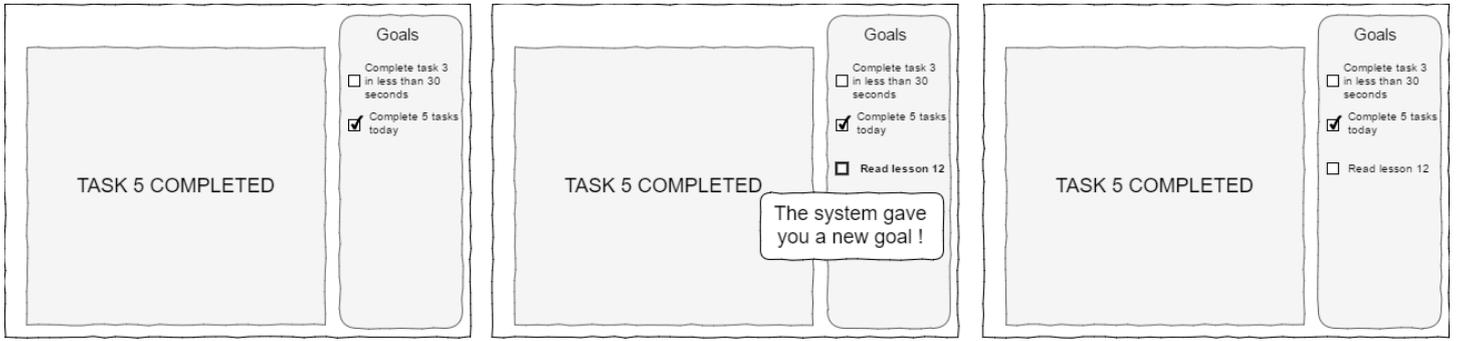


Figure 6: The External Goals storyboard.

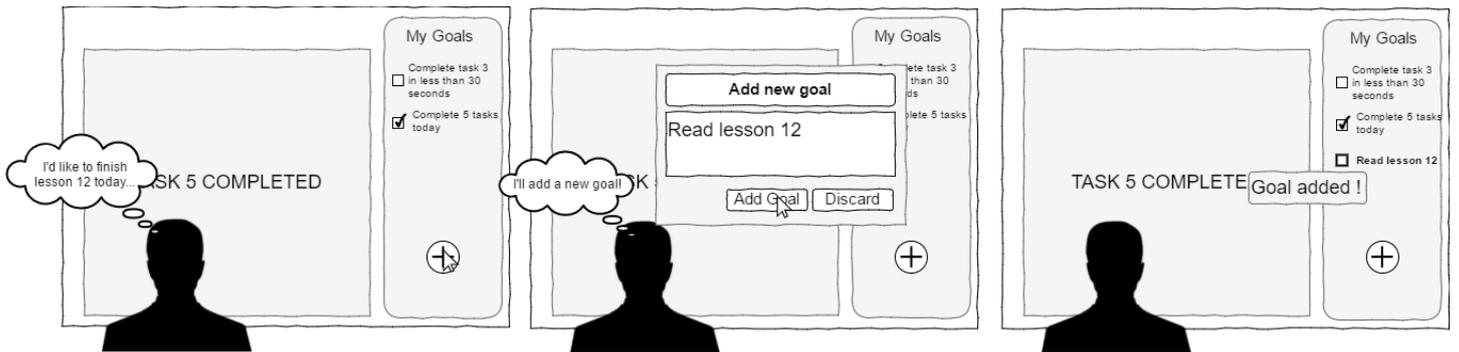


Figure 7: The Self Goals storyboard.

2.3 Time

For the Time motivational strategy we used two game elements. The Schedule storyboard (fig. 8) shows a user over the course of five days. The user needs to complete a task everyday. The user successfully completes a task each day and on the final day unlocks a bonus. The Time storyboard (fig. 9) shows a stopwatch that shows the user how long it took to complete the task. On the bottom right, the user can see a table of previous times.



Figure 8: The Schedule storyboard.

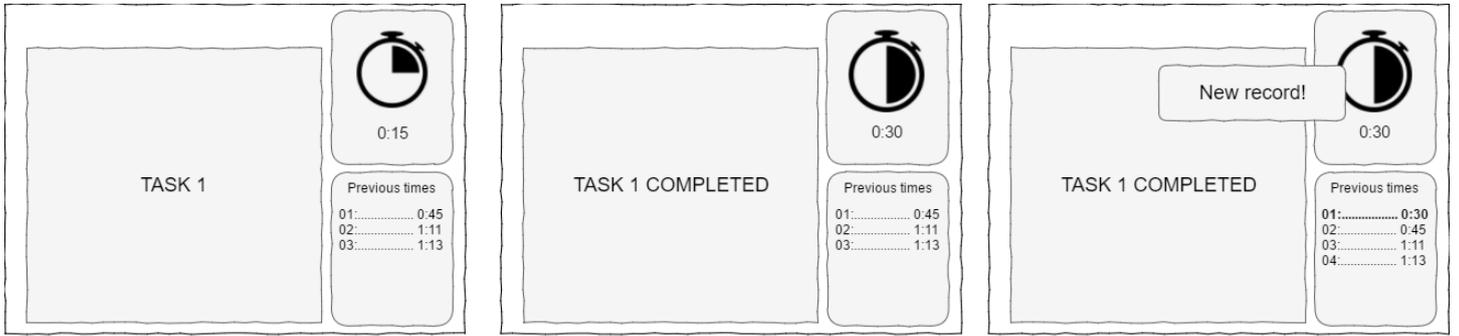


Figure 9: The Timer storyboard.

2.4 Social Interaction

These storyboards represent the 3 game elements that implement the Social Interaction strategy. The Trading storyboard (fig. 10) shows a user that cannot advance without a "key" item. The user then uses the chat on the right to ask if someone can trade a key. Another user (Fred) accepts and proposes to trade a key for three "gems".

The Teams storyboard (fig. 11) shows a user completing a task. On the right the user can see the other members of his/her team as well as an overview of his/her teammates progress. Each time a user in the team completes a task, the team receives points.

In the Discussion storyboard (fig. 12) a user is stuck on a task. He/she uses the chat on the right to ask other users for advice. Another user offers an answer, that the user tries and is able to complete the task. The user also leaves a "like" on the other users' message to let them know that he/she helped.

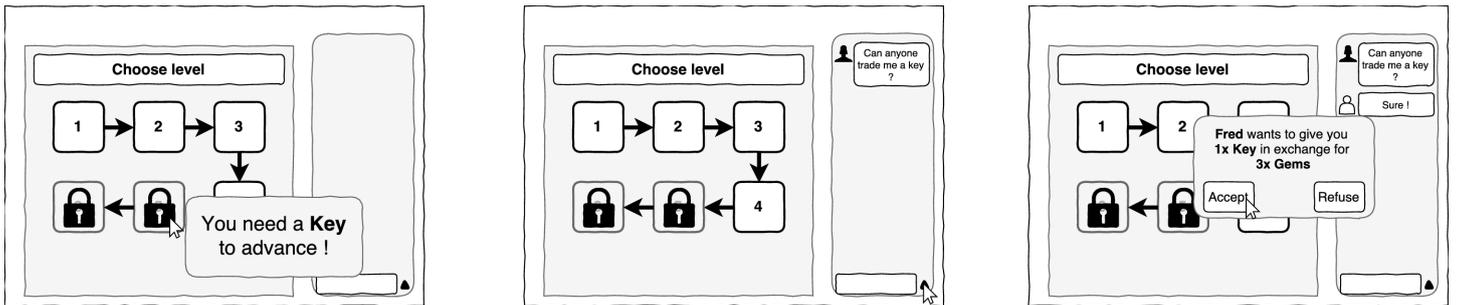


Figure 10: The Trading storyboard.

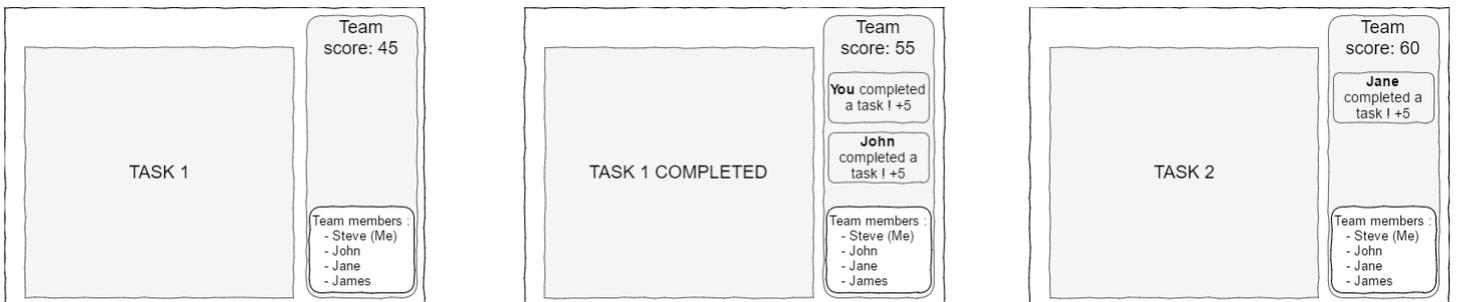


Figure 11: The Teams storyboard.

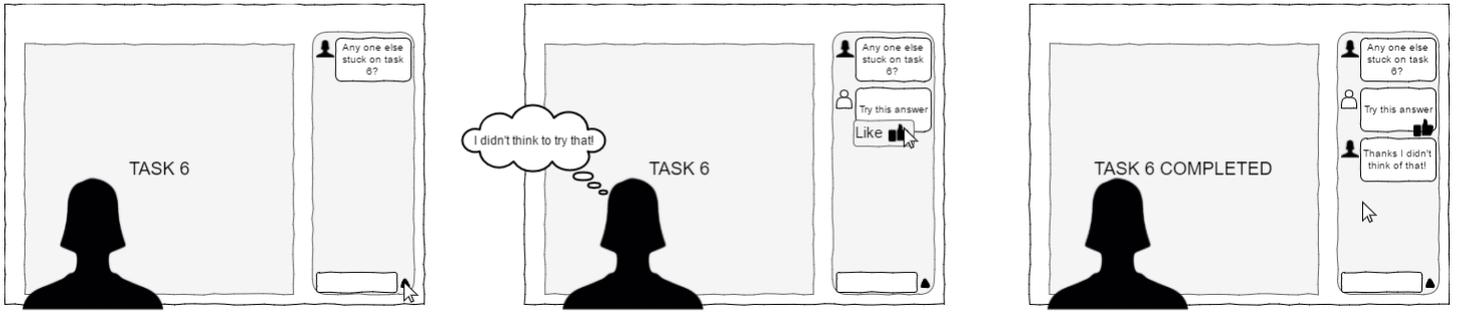


Figure 12: The Discussion storyboard.

2.5 Progress

These storyboards show the two Progress game elements. In the Progress Compared storyboard (fig. 13) the user can see a progress bar on the right. To the left of this progress bar, the user can see how the 25% 50% and 75% of their class is doing. When the user completes more tasks than 50% of the class, he/she is shown a popup that notifies him/her of this. The Progress Task storyboard (fig. 14) shows a simple progress bar on the right. When the user completes a task the bar fills up.

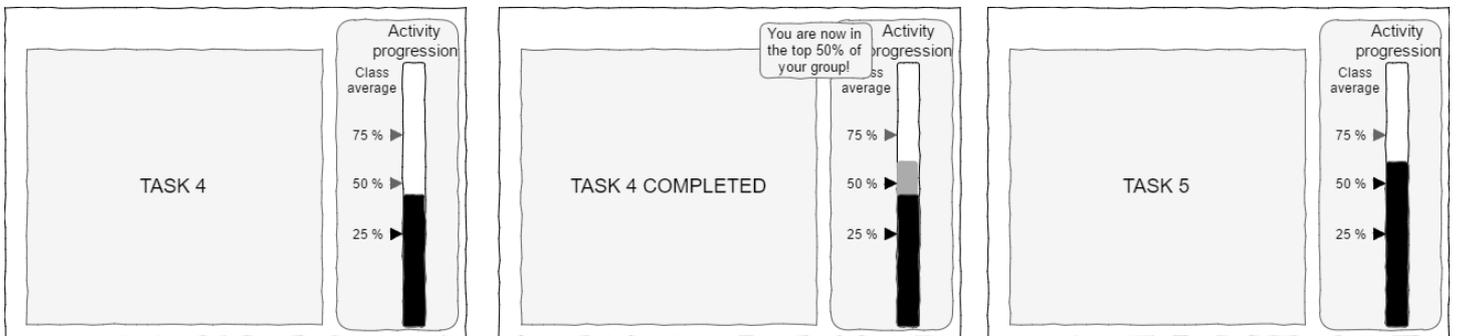


Figure 13: The Progress Compared storyboard.

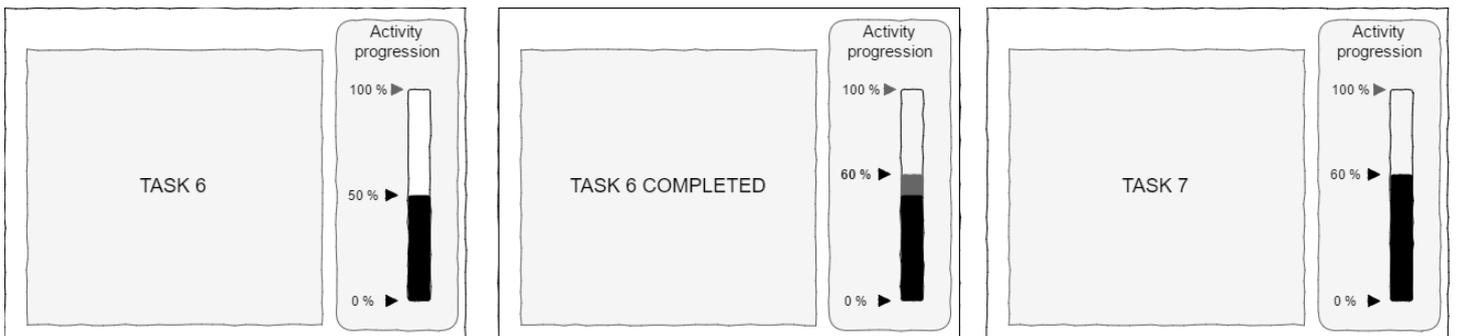


Figure 14: The Progress Task storyboard.

2.6 Test storyboards

As described in section 3. STUDY DESIGN - Data filtering, these are the storyboards used for the "test" questions. Each of these storyboards was presented in a pair with their non test counterpart. Participants that selected more than one wrong answer in these test questions were rejected from our study. The principle is the same for each storyboard, the user receives a penalty for completing the task. For example in the Test situation for Task Progress (fig. 15) the participant had to decide between a storyboard where the gain progression for a task completed, and one where they lose progression for the same task. For the Test situation Badges, the user loses badges (fig. 16), and for both Test situations for Points (fig. 17 & fig. 18) the user loses points.

The order of the test situations was randomized and they were not presented together.

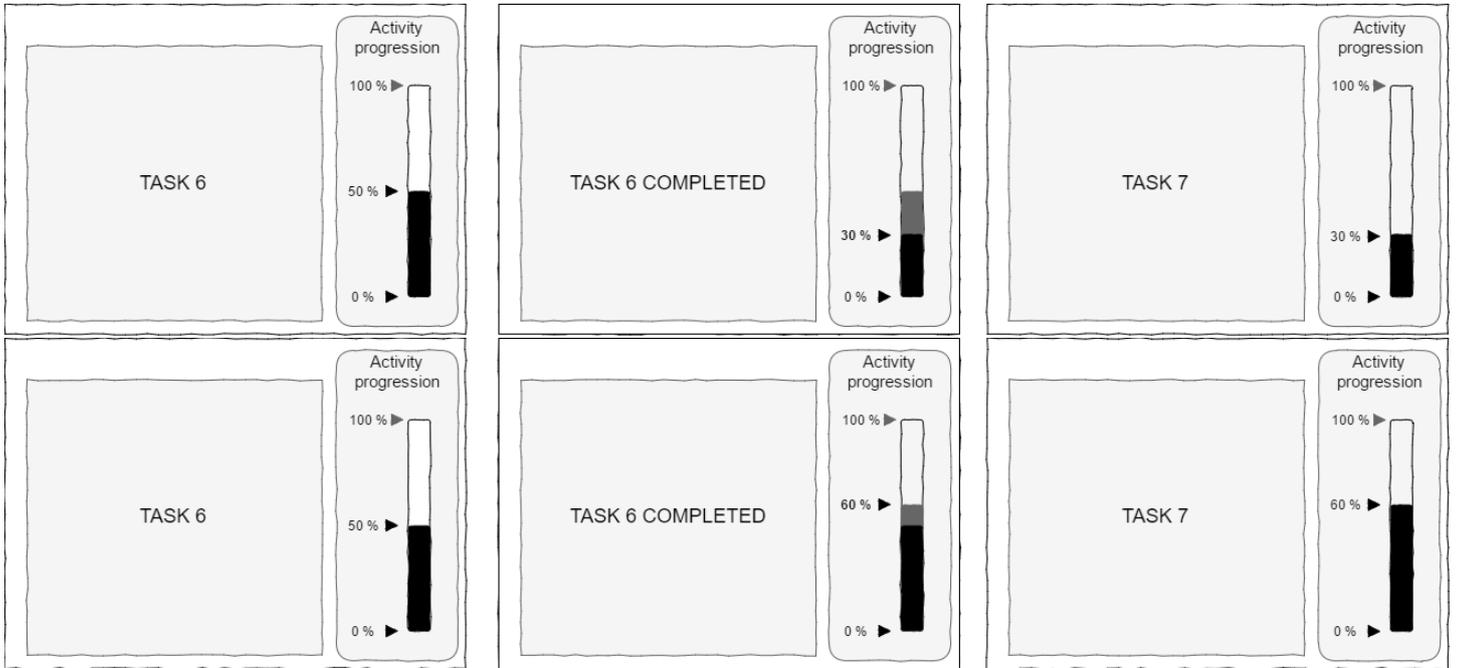


Figure 15: Test situation for Task Progress.

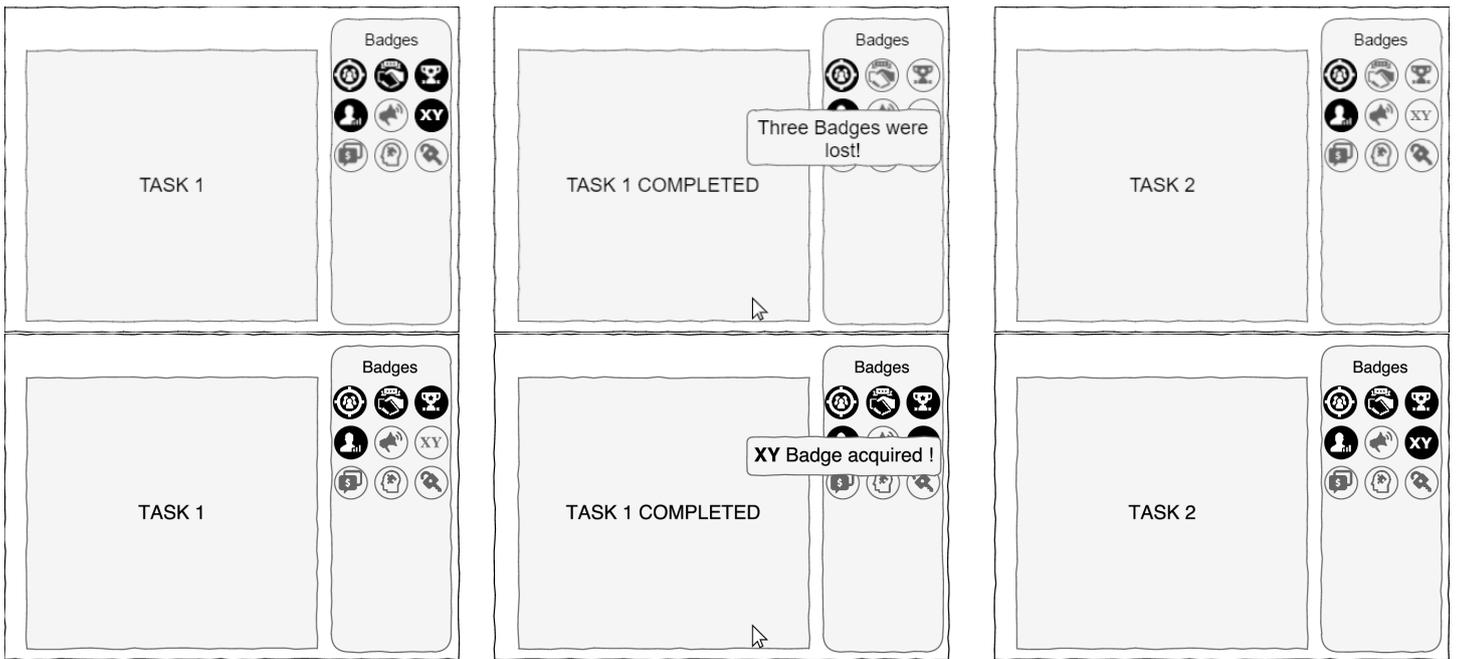


Figure 16: Test situation for Badges.



Figure 17: One of the Test situations for Points.



Figure 18: One of the Test situations for Points.

3 Additional tables and data

3.1 Preference matrix example

As presented in the main paper (see section STUDY DESIGN - Data Analysis), here we show an example of a preference matrix for one participant and five storyboards. In this example the participant voted *Story1* more motivating than *Story2* when presented with the pair *Story1* – *Story2*. The participant also voted for *Story3* each time they were shown it.

	<i>Story</i> ₁	<i>Story</i> ₂	<i>Story</i> ₃	<i>Story</i> ₄	<i>Story</i> ₅	Score
<i>Story</i> ₁	-	1	0	0	1	2
<i>Story</i> ₂	0	-	0	1	1	2
<i>Story</i> ₃	1	1	-	1	1	4
<i>Story</i> ₄	1	0	0	-	0	1
<i>Story</i> ₅	0	0	0	1	-	1

Table 1: Example preference matrix for one participant and five storyboards.

3.2 Game element scores

The following table shows the full game element scores for the entire participant base (as referenced in the main paper, section RESULTS - R1: Perceived motivation for different implementations of motivational strategies).

Motivational strategy	Game element	Average Score	5th Percentile	95th Percentile
Rewards	Badges	0.67	0.64	0.70
	Points	0.42	0.39	0.45
	Useful	0.52	0.50	0.54
Goals	External	0.50	0.48	0.52
	Self	0.41	0.38	0.43
Time	Schedule	0.60	0.57	0.63
	Timer	0.45	0.42	0.48
Social Interaction	Trading	0.51	0.47	0.54
	Teams	0.41	0.38	0.44
	Discussion	0.37	0.34	0.40
Progress	Compared	0.60	0.58	0.62
	Task	0.56	0.54	0.58

Table 2: Game element scores for the entire participant base (contains the values for Figure 2. in our main paper).

3.3 t-test comparison results

The following table shows the full results from the paired t-tests (see main paper section RESULTS - R1: Perceived motivation for different implementations of motivational strategies).

Strategy	Comparison	t	p
Rewards	Badges-Points	137.56	<.001
	Points-Useful	-60.25	<.001
	Useful-Badges	-114.23	<.001
Goals	External-Self	70.34	<.001
Time	Timer-Schedule	-84.22	<.001
SI	Discussion-Teams	-24.34	<.001
	Teams-Trading	-45.33	<.001
	Trading-Discussion	75.67	<.001
Progress	Compared-Task	46.42	<.001

Table 3: Results of the t-test comparisons of average scores between implementations of a same strategy.

3.4 Average agreement for each user type

The following table shows the detailed agreement scores between users from a given dominant user type (as referenced in the main paper section RESULTS - R2 a: Reliability of dominant user type).

Typology	User Type	Average Agreement	5th Percentile	95th Percentile	n
	All	0.06	0.05	0.07	300
Big Five	Agreeableness	0.06	0.04	0.09	73
	Conscientiousness	0.09	0.06	0.11	104
	Emotional stability	0.08	0.04	0.12	46
	Extraversion	0.10	0.06	0.16	17
	Openness to experiences	0.08	0.06	0.12	60
Brainhex	Achiever	0.09	0.05	0.13	32
	Conqueror	0.09	0.05	0.13	48
	Daredevil	0.14	0.08	0.19	21
	Mastermind	0.07	0.05	0.10	118
	Seeker	0.08	0.05	0.13	35
	Socialiser	0.05	0.02	0.09	33
Hexad	Survivor	0.13	0.06	0.21	13
	Achiever	0.11	0.08	0.16	49
	Disruptor	0.13	-0.07	0.44	5
	Free spirit	0.08	0.05	0.10	71
	Philantropist	0.06	0.04	0.08	61
	Player	0.09	0.07	0.12	85
	Socialiser	0.08	0.03	0.13	29

Table 4: Average agreement scores for each user type (contains the values for Figure 3 in our main paper).

4 User type definitions

Here we present short definitions of each user type as provided by the original works that present each typology: Brainhex [3], Hexad [2], and Big Five [1].

4.1 Brainhex typology

- Seeker: people who like finding strange and wonderful things, or finding familiar things.
- Survivor: people who like escaping from hideous and scary threats, pulse-pounding risks.
- Daredevil: people who like negotiating dizzying platforms or rushing around at high speed while you are still in control.
- Mastermind: who like solving puzzles and devising strategies.
- Conqueror: people who like defeating impossibly difficult foes, struggling until you eventually achieve victory, and beating other players.
- Socialiser: people who like hanging around with people you trust, and helping people.
- Achiever: who like collecting anything you can collect, and doing everything you possibly can.

4.2 Hexad typology

- Philantropist: people who are motivated by purpose. They are altruistic and willing to give without expecting a reward.
- Socialiser: people who are motivated by relatedness. They want to interact with others and create social connections.
- Free Spirit: people who are motivated by autonomy, meaning freedom to express themselves and act without external control. They like to create and explore within a system.
- Achiever: people who are motivated by competence. They seek to progress within a system by completing tasks, or prove themselves by tackling difficult challenges.
- Disruptor: people who are motivated by the triggering of change. They tend to disrupt the system either directly or through others to force negative or positive changes. They like to test the system’s boundaries and try to push further.
- Player: people who are motivated by extrinsic rewards. They will do whatever to earn a reward within a system, independently of the type of the activity.

4.3 Big five typology

- Agreeableness: people who are generally considerate, kind, generous, trusting and trustworthy, helpful, and willing to compromise their interests with others.
- Conscientiousness: a tendency to display self-discipline, and strive for achievement.
- Emotional Stability: the tendency to not experience negative emotions, such as anger, anxiety, or depression.
- Extraversion: a pronounced engagement with the external world and enjoyment from interacting with people.
- Openness to experiences: a general appreciation for art, new ideas, imagination, curiosity, and variety of experience

References

- [1] Lewis R. Goldberg. “An alternative” description of personality”: the big-five factor structure.” In: *Journal of personality and social psychology* 59.6 (1990), pp. 12–16.
- [2] A. C. Marczewski. “Even Ninja Monkeys like to play”. In: CreateSpace Indep. Publish Platform, Charleston, 2015. Chap. User Types, pp. 69–84.
- [3] Lennart E. Nacke, Chris Bateman, and Regan L. Mandryk. “BrainHex: preliminary results from a neurobiological gamer typology survey”. In: *International Conference on Entertainment Computing*. Springer, 2011, pp. 288–293.