Supporting the Disney Method with an Interactive Feedback System

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Abstract
Collaborative creativity techniques such as brainstorming, the Six Thinking Hats or the Disney method are common ways to generate ideas in groups. The Disney method is based on three roles aiming at helping groups to consider different views on a topic. As it is difficult for novices to comply with the requirements of this technique, we developed an interactive system supporting groups using this method. Each group member is provided with a tablet to enter ideas and choose the role in which a contribution is made, represented by different colors. We conducted a user study with eight groups and compared two versions: a baseline without additional support and a version with an additional feedback mechanism providing functional feedback about the distribution of the roles. Our main contributions are: (1) a system using feedback to support the Disney method and (2) results indicating that functional feedback can help modest group members to engage more in the group process.

Author Keywords
Creativity technique; Disney method; collaboration; feedback; guidance; tablets

ACM Classification Keywords
H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous.

Roles of the Disney method [6]

D *Role of the dreamer*
The dreamer should help finding new ideas and goals. It provides a vision and has the bigger picture in mind, trying to answer the question "what" in a long term.

R *Role of the realist*
The realist should help transforming fantasies of the dreamer into concrete expressions. It tries to answer the question "how", considering a shorter time frame.

C *Role of the critic*
The critic should help finding problems both in short and long term. It should address constraints and should try to answer the question "why".

Introduction

Collaborative creativity techniques are common methods to solve problems and generate ideas in groups. Brainstorming [12] is probably one of the best known creativity techniques. Other techniques can be used for more specialized use cases. Role-based creativity techniques such as the Six Thinking Hats [4] or the Disney method [6] foster the creative process by using different roles that enable groups to consider a topic from a variety of different perspectives.

The Disney method is a creativity technique based on Walt Disney's way of thinking and working. Dilts [6] describes that Disney used different perceptual positions to develop successful ideas. Three roles seemed to be most important, the *dreamer*, the *realist* and the *critic* (see annotation "Roles of the Disney method"). However, especially for novices it is difficult to adhere to the requirements of this technique, for example to remember the roles and to use them properly. It is further possible that problems such as free riding or social loafing occur that have been reported to lead to a productivity loss in brainstorming sessions [5]. In this paper, we present a system that supports the Disney method and tries to address these issues.

There exist a number of technical applications supporting brainstorming. Hailpern et al. [9] for instance developed an interaction model and a tool called TEAM STORM based on that model, consisting of personal and shared workspaces. Hilliges et al. [10] propose a number of design guidelines for collaborative creativity. There also exist technical applications that support role-based creativity techniques. Tamura et al. [14] present a tool based on a group chat supporting the Six Thinking Hats, Gregory et al. [8] evaluate how the Six Thinking Hats are used in real-life compared to virtual worlds. There also exist commercial solutions in form of smartphone apps supporting the Six Thinking Hats (e.g. [1]).

Our approach of supporting role-based creativity is to use feedback. Generating feedback to support creative processes has been investigated for instance by Xu et al. [17], who evaluated a system called Voyant that crowdsourced feedback on visual designs. We use a feedback system similar to group mirrors. Group mirrors are systems that provide feedback to a group by displaying specific aspects of collaboration back to the group [11], for example by showing speaking times on a display (e.g. [2, 3, 7]). In previous work we could show that self-regulation in brainstorming can be supported with a group mirror [15]. However, showing information about group members such as speaking times or the number of ideas may lead to social pressure and might be frustrating for individual participants (e.g. [2, 13]).

The key part of the Disney method is to look at ideas from three different perspectives. To support this aspect we developed a system that provides functional feedback in form of feedback about the balance of the different roles. This means that our system differs from previous group mirrors that provide feedback about individual performance of the group members. We are interested, what effects this functional feedback has on group processes. In a preliminary study, we compared two versions of the system to each other: (1) a baseline without additional support and (2) a version that additionally provides feedback about the balance of the different roles. Our results indicate that with feedback, roles were used in a more balanced way and especially group members that contributed less than the others in the baseline took part in the process more engaged.

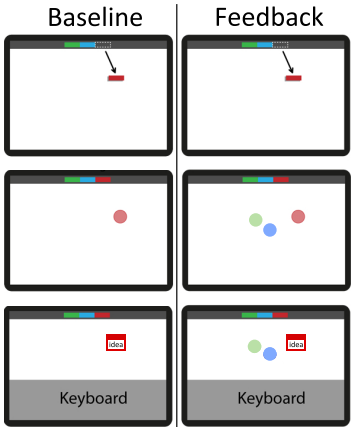

Figure 1: To create a new idea, group members can drag a color from the menu bar to the canvas (top). An empty circle appears. In the baseline, only one circle appears, in the feedback version, unfilled circles of the two other colors appear additionally (middle). The person can then double-click on the circle, a keyboard appears and the contribution can be filled in (bottom). All ideas can be arranged freely on the canvas.

System Design

The system runs on tablet computers and is designed for a scenario in which each group member is equipped with a tablet. The different roles are represented by different colors, based on the approach of the Six Thinking Hats that uses different colors for the roles. The dreamer is represented with green, the realist with blue and the critic with red. The interface consists of two areas, a menu bar and a canvas (see figure 2). The menu bar provides the functionality for deleting and creating ideas (see figure 1). The canvas contains filled, unfilled and blocked ideas.

Each group member has the same view on the interface. All ideas can be freely arranged on the canvas and every action is synchronized with the other tablets. Only when an idea is currently altered by one of the group members, the other group members see this idea as blocked and cannot interact with this idea. Circles that are currently blocked display the characters "(...)". Circles that are not blocked display the first letter of the role ("D "for Dreamer, "R" for Realist and "C" for Critic) to ensure that color-blind people can use the system.

We built two versions of the system, a baseline in which group members can create, alter and delete ideas as described above. In the second version, we integrated an additional feedback mechanism. Underrepresented roles are represented as empty circles in this version. If X, Y, Z are the number of existing ideas of the three roles, the amount of empty ideas of the role x is:

$$x = max(X, Y, Z) - X$$

While filled ideas are displayed as rectangles, empty ideas are displayed as circles, as similar shapes are perceptually grouped together [16]. In this way, participants can easily estimate, which role is under- or overrepresented. The system is implemented as an Android app. To avoid

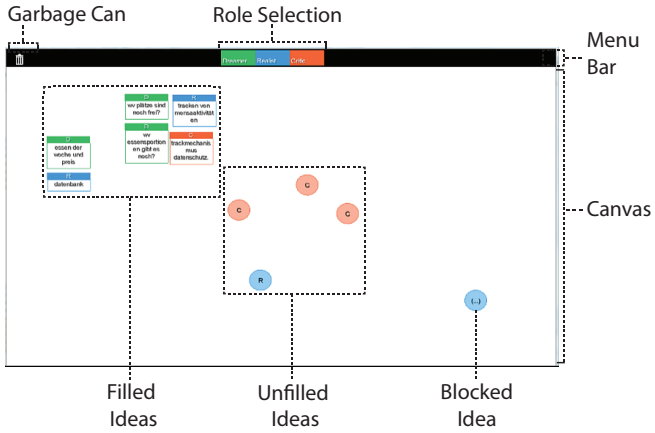

Figure 2: The interface is devided into two areas: (1) the menu bar, which contains a garbage can and a menu for selecting the roles and (2) a canvas, on which filled ideas, unfilled ideas and blocked ideas are displayed.

inconsistencies, a client program runs on a tablet computer while a server holds all data. Server and clients communicate over wireless network through a TCP socket.

Study

Our main goal was to investigate if our system supports groups using the Disney method. We were particularly interested in the effect of feedback about the balance of the roles on group processes.

Participants

We recruited 24 Participants who took part in the experiment in groups of 3. The average age was 23, ranging from 18 to 29. 8 participants were female and 16 were male. Most of them (20) were students, 3 were research assistants and 1 an employee. All participants were paid with a 10€voucher.

Figure 3: Eight groups of three took part in the study. Group members were equipped with tablets to enter ideas.

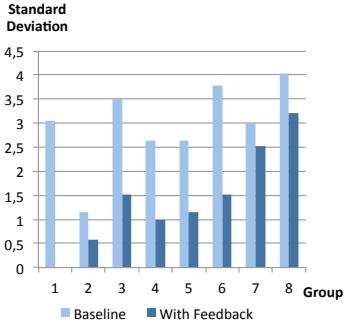

Figure 4: The standard deviation of the number of ideas of the different roles in each group is lower in the feedback condition for all groups compared to the baseline.

Method

We used a within-group, one-factorial design with two conditions: the groups discussed either (1) with or (2) without feedback displaying the balance of the three roles. We assigned two discussion tasks: (A) *Ideas for an app for the students cafeteria* and (B) *Ideas for an app for a dating platform*. We counterbalanced condition × task on the 8 groups; each unique combination was assigned to two groups.

Procedure

Participants were arranged in groups of three around a rectangular table (see figure 3). A short introduction to the study was given and groups were introduced to the Disney method. After that, groups were told how to use the interface. One session consisted of two rounds that lasted 15 minutes each. Participants were allowed to dynamically switch roles during a session. Participants filled in questionnaires after each condition; we conducted a semi-structured interview in the end of the session.

Measurements

Sessions were audio- und video-recorded. We collected quantitative as well as qualitative data. We logged the activities of the individual group members on the tablets such as the creation, deletion and alteration of ideas with timestamp, user ID and content. Qualitative data was collected using the videos, interviews and questionnaires with 5-point Likert scales.

Results

We evaluated the amount of contributions per group to investigate the influence of the guidance mechanism. In the version with guidance, the number of ideas was slightly higher ($M = 25.13$, $SD = 11.18$) than in the baseline ($M = 22.13$, $SD = 6.38$). A paired t-test did not reveal a significant difference.

We were interested, how the roles were used in both versions. The role of the dreamer was used similarily often in the version with feedback ($M = 9.5$, $SD = 3.25$) compared to the version without ($M = 9.5$, $SD = 3.7$). The role of the realist was used slightly more often with feedback ($M = 8.5$, $SD = 3.66$) than without ($M = 7.63$, $SD = 2.97$). The critic was increasingly used in the version with guidance ($M = 7.13$, $SD = 4.26$) compared to the baseline ($M = 5.13$, $SD = 2.36$). A paired t-test did not reveal significant differences.

We were furthermore interested, how balanced the roles were used in the groups. We therefore calculated the standard deviation between the three roles. Figure 4 visually shows that the standard deviation was higher without feedback mechanism for all groups which indicates that roles were used more balanced with feedback.

We further evaluated how persons with different levels of activity changed their behavior with or without feedback. We therefore categorized participants as above and below average. Therefore, the average number of ideas across all roles per person was calculated for the baseline (M=7.71). Group members with more ideas were categorized as above average, participants with fewer ideas as below average. Above average participants slightly increased the number of ideas in the version with guidance ($M = 12.8$, $SD = 3.65$) compared to the baseline ($M = 12.1$, $SD = 2.6$), which is an increase of 5.8%. Below average participants increased the number of ideas more than above average participants. With guidance mechanism, about 32,8% more ideas were produced ($M = 6.07$, $SD = 4.13$) than in the baseline ($M = 4.57$, $SD = 1.83$).

As group mirrors displaying information about performance of individual group members can balance participation, we were interested if a feedback system that

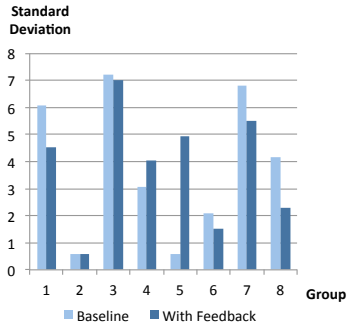

Figure 5: The standard deviation of the number of ideas of the individual participants in each group is lower with feedback for five groups, for one group it is the same while for two groups the standard deviation is higher with feedback.

displays functional feedback has a similar effect. In our case, the functional feedback is provided in form of feedback about the balance of the roles. Figure 5 shows that the standard deviation was lower with feedback for five groups, for one the same and for two higher.

In the questionnaires, we asked participants how well they perceived the synchronicity of the interface. 23 of 24 participants agreed that it did not lead to conflicts. In the interviews, some participants mentioned that they found it confusing in the beginning but helpful after familiarization. The questionnaires provided the possibility to enter own comments. 11 participants mentioned that the interface was easy and intuitive. However, 15 participants found the automatic appearance of empty contribution annoying.

Discussion

The results of the preliminary study indicate that below average participants increase their amount of ideas with the feedback system more than above average participants. One reason might be that the effect of free riding is reduced through the guidance that the feedback provides. Free riding is the effect that group members rest on the efforts of the others. One reason for that is the "perceived effectiveness of individual contributions" [5], as group members might think that their ideas are dispensable. Through the feedback about missing roles, participants might notice that their ideas are not dispensable but valuable and desired. Another reason could be that the task of finding ideas to a certain topic is too vague for some persons and guidance in form of suggestions might help to think in a more directed way.

This effect indicates that functional feedback could have a similar positive effect as group mirrors that provide feedback about performance of individual group members. Functional feedback might put less pressure on group members, as it does not compare group members with each other but provides neutral feedback about the task.

Another effect that the study revealed was that roles were used in a more balanced way. Especially the role of the critic that was used rarely in the baseline was used more often with the feedback system. In general, slightly more ideas were produced; however the guidance mechanism was estimated as bothersome. We will give an outlook on possible improvements and future work in the following.

Conclusion and Future Work

We presented a system that supports groups in using the Disney method. A study revealed first insights in the effects the system on group processes. A number of follow-up studies can be useful to investigate the effects of the system in more detail. One interesting approach would be to compare groups using the system with groups that are guided by a moderator to see, if the tool is comparable to a trained moderator. Another aspect that would be interesting to investigate is the type of feedback. A user study comparing functional feedback to feedback about performance of group members might reveal insights into the effects of these forms of feedback on social acceptance of the feedback and performance of group members.

Another aspect that could be varied is the role distribution. We could show that balancing of the three roles was successful, however in specific use cases it might make sense to focus on a particular role and foster this role by displaying more empty ideas of that role. However, the appearance of empty roles on the canvas was perceived as annoying by some of the participants, so more subtle forms of guidance might make sense, for example varying the amount of available roles in the menu

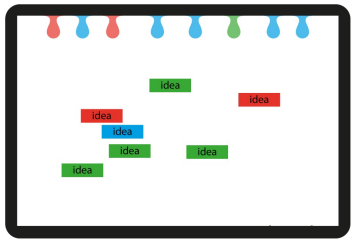

Figure 6: A more subtle form of guidance varies the number of available ideas on the menu bar.

bar (see figure 6). As a next step, we want to investigate how interfaces for co-located groups can be designed so that they are subtle but still have the effect of encouraging participants that contribute less than others.

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