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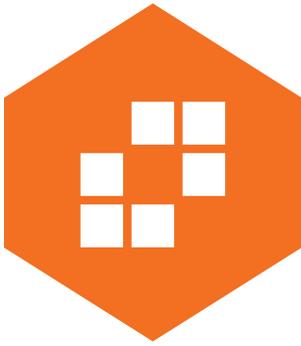


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Configuring Time for Creativity

How to Optimize the Ideation Process in Design

Thinking Workshops

CHAEHAN SO, SOOJUNG JUN, AND KEN NAH

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Configuring Time for Creativity: How to Optimize the Ideation Process in Design Thinking Workshops

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Abstract: The purpose of this study was to investigate whether and to what degree the creative performance of an ideation session depends on the time configuration of an ideation process. To this aim, the present study applied psychological research methodology and yielded the first quantitative insight into this research question. Fifty-six graphic design students produced 13,195 ideas in six experimental sessions of brain-writing, averaging 36.1 ideas per person and experimental session after removal of outliers. The quantitative outcomes of these sessions were combined for pairwise comparisons to test the effect of session type (long session vs. sequenced session), warm-up session (sequenced session vs. long session), interval duration (decreasing intervals vs. shortened overall interval). Results revealed positive effects with large effect sizes in the range of 57–72 percent increase in creative performance for sequenced sessions over long and continuous sessions (H1), for long sessions following a sequenced session (H2a), and for extremely short interval duration over short interval duration of 3 minutes (H3b). Decreasing the interval duration in three subsequent sessions showed a moderate increase (+21%) over short interval duration (H3a). These results are relevant for design educators and design thinking practitioners as they provide consistent evidence for optimized creative performance if ideation sessions are structured in several intervals of extremely short duration.

Keywords: Creativity, Creative Idea Generation, Design Thinking, Brain-writing, Brainstorming, Design Method

Introduction

Ideation is the activity of creative idea generation. Nearly all fields of creative industry, ranging from architecture, fashion, advertising, graphic design, to product design and service design, employ dedicated exercises for generating new ideas (Aurum and Gardiner 2003). Creative teams in professional environments typically devote a session of one to several hours for ideation (Rossiter and Lilien 1994). Although the duration of such sessions sometimes extends to one day or even several days, such cases are not ideation activities in the strict sense, as they also encompass reflection or prototyping activities to some degree. The main purpose of an ideation session is creative idea generation, usually performed by some form of brainstorming activity (Isaksen and Gaulin 2005).

Brainstorming methodology has improved over the years due to insights from research about factors that limit creativity. One such factor is the so-called production blocking effect (Diehl and Stroebe 1987), i.e. when listening to other ideas, people are prevented from generating more ideas because they dedicate cognitive resources which they cannot use for producing their own ideas. As a result, group brainstorming method is inferior to individual brainstorming when verbal exchange of ideas is used (Mullen, Johnson, and Salas 1991). To counter the production blocking effect, creative methods must eliminate verbal communication among participants. One alternative method is called brain-writing (VanGundy 1984), a creative method that replaces verbal communication exchange with writing. A popular brain-writing practice is to use post-its to jot down ideas because it allows the sharing of ideas by simply sticking the post-its on a pin board or wall (Isaksen and Stead-Dorval 1998). Overall, brain-writing increases the total amount of generated ideas in a group because it enables people to produce ideas silently without disturbing others (Paulus and Yang 2000). Evaluating the quantitative outcome of such brain-writing activity measures the ability to generate a large number of ideas. This ability is called

ideational fluency in creativity research (Runco et al. 2011). The present study focuses on ideational fluency because it directly refers to the goal “quantity is wanted”, a core rule of brainstorming posited by Osborn (1957).

Designers often perform brainstorming activity in sessions of one to several hours to enable incubation of ideas. From a scientific standpoint, however, better brainstorming performance can be reached in shorter durations in the order of 15 minutes (Rossiter and Lilien 1994). Design thinking practitioners realize such a short session either as a whole or in a sequenced manner, i.e. a sequence of short intervals of several minutes of individual brain-writing with subsequent group sharing activity. Which of these time configurations produces a higher creative performance has not been under scientific investigation so far. Research on creativity has mainly focused on creative methods without a quantitative comparison of configuration parameters within one particular method. For example, Herring et al. (2009) found 19 distinguishable creative idea generation techniques in the professional field. Yilmaz et al. (2010) analyzed and compared the frequency of use of six different design heuristics used by design students. Consequently, no details on how to optimize ideation session outcomes solely by configuration parameters have been revealed yet, e.g. whether several short intervals are more effective than one long session. That no such research has been done yet is surprising because it bears relevance not only for the growing community of design thinking practitioners but also for the vast field of creative professionals in general. For this creative practitioner world, it would be useful to know whether there are specific ways to increase the creative performance of a given group of individuals, and if yes, how these ways can translate into an optimal configuration of the ideation process. The advantage of focusing on the process configuration is that the ideation process requires no sophisticated tools. Hence any found factor, however small the effect, can be applied with minimal preparation. Optimizing the ideation process could provide creative teams with the necessary competitive edge for truly original solutions.

Based on these considerations, the resulting research question is: Can we increase creative performance by time configuration of the ideation process? The time-related configuration parameters which practitioners can control are ideation interval duration, idea sharing, and whether prior exercises for warm-up purposes are employed. Knowing these parameters and ease of modification, we can derive the following hypotheses:

- **H1:** The creative performance is greater for a sequenced than for a long brain-writing session.
- **H2:** A warm-up session increases the creative performance
 - ...of a long session. (H2a)
 - ...of a sequenced session. (H2b)
- **H3:** Compared to a sequenced session of 5 x 3min, the creative performance is higher
 - ...with decreasing interval duration. (H3a)
 - ...with shorter interval duration for all intervals. (H3b)

Method

Participants

For participants, the present study recruited 56 female students of graphic design who attended the visual ideation class at Soongyei Women’s College, Seoul (see Figure 1). Students ranged in age from eighteen to twenty-three years, with a mean of 19.3 years (SD=0.79). Four participants were removed from the count because the student number in the three cohorts was not equal to a multiple of four. The remaining fifty-two participants were randomly assigned to groups of four people.

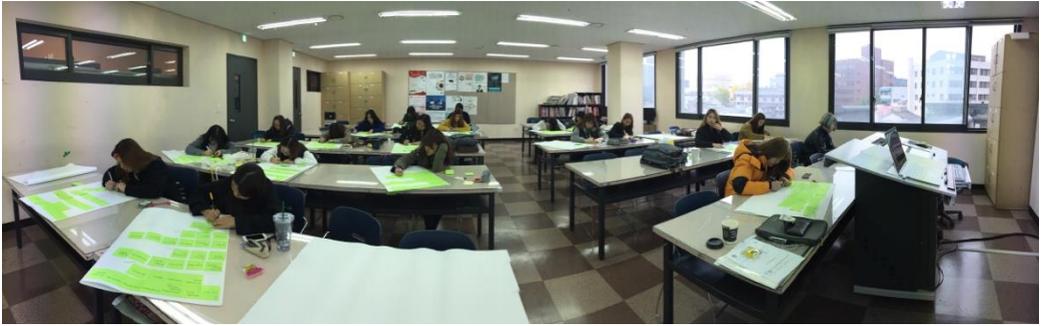


Figure 1: Twenty Students During an Experimental Session

Research Design

The experimental design was constructed to test the hypotheses derived from the research question with the least number of experimental sessions. Therefore, participants were assigned to three experiments (1, 2, 3) that each consisted of two experimental variants (A, B) resulting in a total of six experimental sessions (1A, 1B, 2A, 2B, 3A, 3B). As a result, the experimental sessions listed in Table 1 were conducted to generate all experimental and control conditions. Experimental session 1, 2, 3 were conducted in consecutive weeks to avoid mental fatigue of the participants.

The following terminology is used for clear reference of collected data: An *experiment* consisted of two *experimental sessions* that could either be of type “long session” (15 min) or “sequenced session”. The latter consisted of several *intervals* (2–5 min) of brain-writing activity which were separated by *breaks* (2–3 min). The experimental sessions were conducted in an identical procedure. The problems in the experimental sessions were formulated in one of two *experimental variants* A or B which had been rated as equivalent regarding the difficulty of imagination and accessibility from the students’ perspective. The breaks between intervals had the same duration as the intervals except for experimental session 3A (decreasing interval), in which all breaks lasted 3 minutes. The breaks of the first and second experiment were silent, whereas the breaks for the third experiment were active in the sense that participants shared their generated ideas.

Table 1: Experimental Sessions, Session Type, Break Type

Experimental Session	Session Type	Break/Sharing Type
1A	Long Session, 15 Min., No Break	No Break, No Sharing
1B	Sequenced Session, 5 x 3 Min.	3 Min. Breaks, No Sharing
2A	Sequenced Session, 5 x 3 Min.	3 Min. Breaks, No Sharing
2B	Long Session, No Break	No Break, Silent Sharing
3A	Sequenced Session, 5 Min - 3.5 Min - 2 Min.	3 Min. Breaks, Sharing
3B	Sequenced Session, 5 x 2 Min.	2 Min. Breaks, Sharing

All hypotheses were tested by between-group comparisons of two experimental session outcomes. The following specifies the experimental sessions selected for control and experimental conditions, as well as metrics used, for each hypothesis.

Experiment Design for H1

Hypothesis to be tested: The creative performance is greater for a sequenced than for a long brain-writing session.

Metrics used (details see Table 2):

- creative performance overall: long session output
- creative performance overall: sequenced session output

Table 2: H1-Test - Experimental & Control Conditions, Experimental Sessions

	Warm-up Session	Experimental Session
Experimental Condition	Sequenced Session, 5 x 3 Min.	1b
Control Condition	Long Session, 15 Min.	1a

Experiment Design for H2a

Hypothesis to be tested: A warm-up session increases the creative performance of a long session.

Metric used (details see Table 3):

- creative performance overall: long session output

Table 3: H2a-Test - Experimental & Control Conditions, Experimental Sessions

	Warm-up Session	Experimental Session
Experimental Condition	Yes	2b
Control Condition	No	1a

Experiment Design for H2b

Hypothesis to be tested: A warm-up session increases the creative performance of a sequenced session.

Metric used (details see Table 4):

- creative performance overall: long session output
- creative performance partitioned: n-th sequence output (n number of interval in ascending order)

Table 4: H2b-Test - Experimental & Control Conditions, Experimental Sessions

	Warm-Up Session	Experimental Session
Experimental Condition	Yes	1b
Control Condition	No	2a

Experiment Design for H3a

Hypotheses to be tested: Compared to a sequenced session of 5 x 3 minutes, the creative performance is higher with decreasing interval duration.

Metric used (details see Table 5):

- creative performance overall: sum over all intervals' output
- creative performance partitioned: n-th sequence output (n number of interval in ascending order)

Table 5: H3a-Test - Experimental & Control Conditions, Experimental Sessions

	Sequence Duration	Experimental Session
Experimental Condition	5 Min–3.5 Min.–2 Min.	3a
Control Condition	5 x 3 Min	2a

Experiment Design for H3b

Hypotheses to be tested: Compared to a sequenced session of 5 x 3 minutes, the creative performance is higher with shorter interval duration.

Metric used (details see Table 6):

- creative performance overall: sum over all intervals’ output
- creative performance partitioned: n-th sequence output (n number of interval in ascending order)

Table 6: H3b-Test - Experimental and Control Conditions, Experimental Sessions

	Sequence Duration	Experimental Session
Experimental Condition	5 x 2 Min.	3b
Control Condition	5 x 3 Min.	2a

Procedure

All experiments were conducted in three classes on November 9th, 17th, and 23rd of 2015. Participants were provided with post-its and sheets of large paper to hold them. Only post-its of the same color and size were used to avoid any diversion of attention. Participants were instructed to solve the given problems by creative idea generation on post-its, and to write one idea per post-it. All participants had received prior training in brain-writing and brainstorming methods before the experiment, and thus didn’t encounter any technical problems in the task (see Figures 2 and 3).

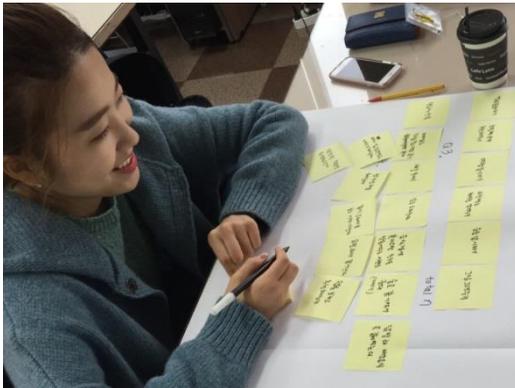


Figure 2: A Student Brain-writing during an Experimental Session
Source: So, Jun, Nah



Figure 3: Brain-writing with Post-Its
Source: So, Jun, Nah

All groups experienced the same experiment procedure with the same facilitator (second author) as in the following:

1. The facilitator presents the problems to be solved for the subsequent ideation sessions (see Table)
2. Experimental session A
3. Break 10 minutes
4. Experimental session B
5. End experiment

The ideation tasks kept similar wordings across variants of the same experiment to enable comparability of results. In contrast, to avoid overlapping or repetition effects, wordings varied considerably across experiments (see Table 7).

Table 7: Ideation Tasks in Experimental Variants

Experimental Variant	Experiment 1	Experiment 2	Experiment 3
A	How can we help lonely people to be happy?	Ideal housing?	How can we make campus life better than now?
B	How can we help stressed people to relax?	Ideal vacation?	How can we make winter break time well?

Results

In total, 13195 ideas were generated by 52 subjects across six experimental sessions. To identify outliers, we used a threshold value specified as two standard deviations above the mean. Applying this criterion lead to 42 outlier occurrences which were deleted pairwise before the subsequent hypothesis tests. After subtracting all outlier occurrences, the total number of ideas was 11277, averaging 36.1 ideas per subject and experimental session. The majority of the participants (82.2%) generated 30 or more ideas, with an average of 39.4 (sd=15.5, range 9-86). In only 0.2% of all cases, participants generated less than 20 ideas in an experimental session.

Session Type (H1)

The creative performance was distinctly higher by 71.6% in the sequenced session (experimental session 2A) with 2109 ideas in total, compared to 1229 ideas generated in the long session (experimental session 1A). This difference was significant in a T-test (two independent samples, two-sided) on p=0.000. Four outliers had been removed because they scored more than the threshold value specified as two standard deviations above the mean (54, 61>53.5 long session, 108, 90>88.9 sequenced session). Standardized to individual creative performance, this result equals 43.9 ideas (sd=16.9) in the sequenced session, compared to 25.6 ideas (sd=11.0) in the long session. As a result, we confirm hypothesis H1 (*The creative performance is greater for a sequenced than for a long brain-writing session*).

Warm-up Session (H2)

The H2a test revealed that the creative performance was distinctly higher (+67.8%) in the session preceded by a warm-up session with 1814 ideas in total, compared to 1230 ideas from the session without a preceding warm-up session. This difference was significant in a T-test (two independent samples, two-sided) on p=0.000. Four outliers had been removed because they scored more than the threshold value specified as two standard deviations above the mean (92, 88 >75.4 session 2B, 54, 61>53.5 session 1A). Standardized to individual creative performance, this results equals 37.8 ideas (sd=14.5) in the sequenced session, compared to 25.6 ideas (sd=11.1) in the long session. However, the creative performance of a sequenced session did not increase (-0.1%) with 2123 ideas (1B) compared to 2121 ideas in the warm-up session (2A) (H2b). This was equivalent to an average of 44.2 ideas in individual performance for both sessions (44.23, 44.19), again after the removal of four outliers.

The inconsistent results for H2a and H2b tests motivated a more detailed analysis by a different metric. Before, we tested the hypotheses by a globally defined metric, creative performance overall, i.e. the sum of all intervals’ output. Now, we used a metric that allowed a partitioned view of creative performance: the n-th interval output (n number of interval in ascending order). Using this metric revealed the following pattern (see Table 8): The creative performance of sequenced sessions is higher in the first and second interval, but lower in the third, fourth and fifth interval.

In conclusion of the preceding analysis, it seems appropriate to refine the hypothesis formulation of H2b because the warm-up sessions were not identical. The revised version of hypothesis H2b, combined with H2a, takes the following form: **H2 revised**—A sequenced session increases the creative performance of a subsequent long ideation session (H2a) or vice versa (H2b). Based on the revised hypothesis, we can confirm hypothesis H2a but must disconfirm H2b.

Table 8: Creative Performance per Interval in H2b-Test

Session Sequence	1	2	3	4	5
Difference	106%	103%	94%	93%	91%
Experimental Condition 1B	10.0	9.8	9.0	9.3	9.3
Control Condition 2A	9.4	9.5	9.6	10.0	10.2

Interval duration (H3)

To enable a fair comparison for H3a and H3b, the creative performance must be standardized per person *and per minute*, not only per person, because the total amount of minutes varies. As in the preceding analyses, four outliers were removed. The H3a test yielded that standardized creative performance of a sequenced session with decreasing interval duration (5–3.5–2 min.) was moderately higher (+20.6%) with 170.6 ideas per minute (1,791 ideas in total) than that of the sequenced 5 x 3 min. session with 141.4 ideas per minute (2,121 ideas in total). This difference was significant in a T-test (two independent samples, two-sided) on $p=0.009$. Thus we can confirm hypothesis H3a (*Compared to a sequenced session of 5 x 3min, the creative performance is higher with decreasing interval duration*).

The H3b test revealed that the creative performance of a sequenced session with shorter interval duration (2 min) was distinctly higher (+57.2%) with 4.66 ideas per min and person (2300 ideas in total than that of the 3 min interval duration with 2.96 ideas per person (2,090 ideas in total). This difference was significant in a T-test (two independent samples, two-sided) on $p=0.000$. Thus we can confirm hypothesis H3b (*Compared to a sequenced session of 5 x 3 min., the creative performance is higher with shorter interval duration*).

Summary of Hypothesis Tests

The present study conducted five hypothesis tests by between-group comparisons with t-tests on the assumption of heteroscedasticity and two-tailed distribution. The results are summarized in Table 9. One hypothesis test (H2b) found no difference between groups. All the remaining hypotheses could be confirmed by the statistical analyses. The H3a test found a moderate (20.6%) effect size on $p=0.009$. The remaining tests of H1, H2a and H3b found high effect sizes (71.6%, 67.8%, and 57.2%), and this difference was highly significant on $p=0.000$.

Table 9: Summary of Hypothesis Tests

Hypothesis	H1	H2a	H2b	H3a	H3b
Hypothesis Confirmed	Yes	Yes	No	Yes	Yes
Effect Size	71.6%	67.8%	0.1%	20.6%	57.2%
P-Value	0.000	0.000	0.989	0.009	0.000

Discussion

The present study focused on a detailed aspect of an ideation session which had not been covered in creativity research so far—time configuration. The analysis revealed surprisingly large effect sizes in the range of 57–72% for hypotheses that were based only on the details of duration in an ideation session. The high effect sizes clearly demonstrate that the time configuration plays a major role in creative performance. This notion has not only been neglected by design thinking practitioners, but also by corresponding research in this context.

The results corroborate the clear superiority of sequenced sessions over long, extended sessions of 15 minutes. This is an interesting result because sessions of this duration length are common among design practitioners and even regarded as rather “short” sessions (Rossiter and Lilien 1994). Practitioners must therefore consider a switch from extended to sequenced sessions consisting of short intervals. Concerning interval duration, preference should be given to extremely short durations of two minutes.

The mixed results of hypothesis 2 about the warm-up session effect can be understood by a simple interpretation: The creative performance of a sequenced session is higher even without warm-up, or in other words, it is independent of a preceding warm-up session. The sequenced session may already ignite creativity during the short intervals which does not happen during the long session. The underlying reason may lie in the additional time constraint which is known for a small creativity boost effect (Burroughs and Mick 2004). Another explanation why the sequenced session did not yield more ideas than the session with a preceding long warm-up could lie in the presence of two overlapping effects—warm-up and exhaustion: The warm-up effect is observable in the first two sessions, but is overcompensated by the exhaustion effect from the third interval.

Taken together, several short intervals clearly yield the best creative performance in an ideation setting. There are several possible psychological conjectures about this insight: People quickly become exhausted from idea generation because it creates a relatively high cognitive load from which people need to recuperate. Due to this exhaustion, people may need a quick break for mind wandering which increases creativity (Baird et al. 2012). Another cognitive explanation is that the creative process depends on the ability to continually retrieve items from long-term into working memory, and a break can refresh this working memory buffer more effectively than extended memory search.

The largest limitation of this study is its clear focus on the quantitative aspect of creativity. Although a correlation to the qualitative side has been shown (Baruah and Paulus 2008), future research remains to prove whether the findings of this study still hold for generating not only more but also more original ideas. The present study contributes to the academic discussion of design thinking practice, predominated by qualitative evaluations, with detailed quantitative insights about the undiscovered leverage of time. Practitioners can easily adopt the specific time parameters of interval and break duration provide a blueprint in their ideation sessions. Furthermore, they can use the reported standardized individual performance results as benchmark for ideation sessions. The potentially most surprising insight for practitioners is the counterintuitive notion that the longer period required for incubation of ideas is maybe a myth, at least for the quantitative perspective of creativity.

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REFERENCES

- Aurum, Aybuke, and Adrian Gardiner. 2003. "Creative Idea Generation." *Australian Studies in Knowledge Management*.
- Baird, Benjamin., Jonathan Smallwood, Michael D. Mrazek, Julia W. Y. Kam, Michael S. Franklin, and Jonathan W. Schooler. 2012. "Inspired by Distraction: Mind Wandering Facilitates Creative Incubation." *Psychological Science* 23 (10): 1117–22. doi:10.1177/0956797612446024.
- Baruah, Jonali, and Paul B Paulus. 2008. "Effects of Training on Idea Generation in Groups." *Small Group Research* 39 (June): 523–41. doi:10.1177/1046496408320049.
- Burroughs, James E., and David Glen Mick. 2004. "Exploring Antecedents and Consequences of Consumer Creativity in a Problem-Solving Context." *Journal of Consumer Research* 31 (2): 402–11. doi:10.1086/422118.
- Diehl, M., and W. Stroebe. 1987. "Productivity Loss in Brainstorming Groups: Toward the Solution of a Riddle." *Journal of Personality and Social Psychology* 53: 497–509.
- Herring, S. R., J. B. Jones J., and P. B. Bailey. 2009. "Idea Generation Techniques among Creative Professionals." *42nd Hawaii International Conference on System Sciences*, 1–10.
- Isaksen, Scott G., and J. P. Gaulin. 2005. "A Reexamination of Brainstorming Research: Implications for Research and Practice." *Gifted Child Quarterly* 49 (4): 315–29. doi:10.1177/001698620504900405.
- Isaksen, Scott G, and K Brian Stead-Dorval. 1998. *Toolbox for Creative Problem Solving: Basic Tools and Resources*. Book. Creative Problem Solving Group—Buffalo.
- Mullen, Brian, Craig Johnson, and Eduardo Salas. 1991. "Productivity Loss in Brainstorming Groups: A Meta-Analytic Integration." *Basic and Applied Social Psychology* 12 (1). Lawrence Erlbaum Associates, Inc.: 3–23. doi:10.1207/s15324834basps1201_1.
- Osborn, Alex Faickney. 1957. *Applied Imagination. Principles and Procedures of Creative Problem Solving*. Scribner. New York: Scribner.
- Paulus, P. B., and H. C. Yang. 2000. "Idea Generation in Groups: A Basis for Creativity in Organizations." *Organizational Behavior and Human Decision Processes* 82 (1): 76–87.
- Rossiter, J. R., and G. L. Lilien. 1994. "New 'Brainstorming' Principles." *Australian Journal of Management* 19 (1): 61–72. doi:10.1177/031289629401900104.
- Runco, Mark a., Ernest P. Noble, Roni Reiter-Palmon, Selcuk Acar, Terry Ritchie, and Justin M. Yurkovich. 2011. "The Genetic Basis of Creativity and Ideational Fluency." *Creativity Research Journal* 23 (4): 376–80. doi:10.1080/10400419.2011.621859.
- VanGundy, Arthur B. 1984. "Brain Writing for New Product Ideas: An Alternative To Brainstorming." *Journal of Consumer Marketing* 1 (2): 67–74. doi:10.1108/eb008097.
- Yilmaz, S., C.M. Seifert, and R. Gonzalez. 2010. "Cognitive Heuristics in Design: Instructional Strategies to Increase Creativity in Idea Generation." *Artificial Intelligence for Engineering Design, Analysis and Manufacturing* 24 (3): 335–55.

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