# Comparison of Modified Hybrid Brainstorming With a Conventional Brainstorming Program to Enhance Nurses' Innovative Idea Generation

*Nongnut Boonyoung, PhD, RN; Katekanok Kamonmarttayakul, MSN, RN; and Sasitorn Phumdoung, PhD, RN*

## abstract

***Background:*** This study investigated the effectiveness of a modified hybrid brainstorming (MHB) program against conventional brainstorming (CB) to achieve idea generation during innovation initiatives in nursing. ***Method:*** Pretest and posttest outcomes comparing the two brainstorming methods were tested during a training exercise ($N = 56$). The MHB group ($n = 29$) was trained to apply CB for problem identification and MHB for idea generation. The CB group ($n = 27$) was trained to apply only CB. ***Results:*** The MHB method significantly enhanced idea fluency, flexibility, and originality from pretest to posttest ($p < .05$) and increased idea fluency and originality to a greater extent than the CB method. ***Conclusion:*** The MHB learning program can enhance nurses' innovative idea generation by promoting idea fluency and originality. **[*J Contin Educ Nurs*. 2021;52(2):72-78.]**

Nurses are a vital component of health care teams. Nurses can be at the forefront of innovation to improve patient care and its outcomes (Lopez et al., 2019) because they can be close to the patient and family, use technology and new devices at the point of care, and interact with processes that moderate work performance. In health care systems, design thinking (MacFadyen, 2014) and experiential learning theory (ELT) (Sutanto, 2017) are effective approaches to promote innovation. Thus, for the reasons mentioned, organizations should seek nurse input in all aspects of design thinking and implementation.

Previous studies show that the quality of an initial innovative idea often affects the success of the corresponding innovation (Kornish & Hutchison-Krupat, 2017). Therefore, innovative idea generation is an essential step in the innovation process (Kornish & Hutchison-Krupat, 2017; MacFadyen, 2014), which includes problem identification, idea generation, and idea evaluation (O'Loghlin, 2016). In each of these steps, brainstorming is a tool that has merit, thus supporting our reasoning for examining its impact (Al-Samarraie & Hurmuzan, 2018; Korde & Paulus, 2017).

The problem identification phase identifies a problem or opportunity that can be improved by innovation (Hocking & Vernon, 2017; MacFadyen, 2014; O'Loghlin, 2016) using critical thinking and effective systematic tools (Foor, 2017). Generally, conventional brainstorming (CB) (Koroh et al., 2017) through the five Ws and one H questions (i.e., who, what, when, where, why, and how) is used to address well-defined problem statements (Misiurek, 2016).

The idea generation phase produces novel ideas (Kor-

*Dr. Boonyoung is Associate Professor and Dean, Ms. Kamonmarttayakul is PhD candidate, and Dr. Phumdoung is Lecturer, Prince of Songkla University, Songkhla, Thailand.*



*The authors have disclosed no potential conflicts of interest, financial or otherwise.*

*Address correspondence to Nongnut Boonyoung, PhD, RN, Associate Professor and Dean, Prince of Songkla University, 15 Kanjanavanich Road, Kho Hong, Hat yai, Songkhla, Thailand 90110; email: nongnut.b@psu.ac.th.*

*Received: April 27, 2020; Accepted: September 10, 2020*
*doi:10.3928/00220124-20210114-06*

nish & Hutchison-Krupat, 2017) through creativity (divergent and convergent thinking) (Rietzschel & Ritter, 2018), cognitive stimulation (Korde & Paulus, 2017), appropriate group structure and effective group interaction styles (Korde & Paulus, 2017), and the provision of suitable external stimuli amid idea generation (Hidayanti et al., 2018). Cognitive stimulation occurs when using brainstorming and analogical thinking strategies (Kim & Park, 2017), the latter of which allows individuals to take knowledge from past experiences and apply it to new scenarios (Kim & Park, 2017; Korde & Paulus, 2017). Accordingly, a previous study showed that brainstorming is a cognitive stimulation method that promotes group creativity (Al-Samarraie & Hurmuzan, 2018; Korde & Paulus, 2017). Alex Osborn developed a brainstorming method for problem solving and idea generation in which people generate the greatest possible number of ideas without judgment; this includes generating and combining "wild" ideas (Al-Samarraie & Hurmuzan, 2018).

Generally, brainstorming is performed in two ways: the conventional verbal approach (i.e., CB) (Al-Samarraie & Hurmuzan, 2018) and the nonverbal approach, which is called brainwriting (Korde & Paulus, 2017). CB is the first form of brainstorming and refers to active participation and interaction between group members through dialogue and sharing thoughts throughout the session (Al-Samarraie & Hurmuzan, 2018). Although CB is useful for both the problem identification and idea generation phases, its negative effects include production blocking (when one person is overly active and creative, consequently inhibiting less active members from participation), evaluation apprehension (being afraid one's proposed idea will be ridiculed by other group members), and social loafing and free riding (exerting less effort than other group members but reaping the same benefits) (Wang, 2019). Notwithstanding, CB remains a highly recommended method for the problem identification phase (Koroh et al., 2017).

Brainwriting combines individual- and group-based activities during the idea generation phase. Group members generate ideas by writing them down on paper/sticky notes and sharing them within the group, without talking, for four or five 8-minute rounds (Korde & Paulus, 2017). This method may engender a significantly higher level of originality compared with CB (Paulus et al., 2015). However, it also has possible negative effects; as time progresses, participants may fixate on certain ideas (Korde & Paulus, 2017; Wang, 2019).

Analogical thinking, another cognition stimulation method, is the collection of information or knowledge from former innovative idea generation experiences (the source or analogy) to generate new ideas (the target) (Kim & Park, 2017). This method assumes that people can generate new ideas more effectively if they have experienced, or have associations with, similar problems (Kim & Park, 2017). This is followed by incubation, which allows the unconscious mind to process information and is a significant next step toward allowing people who are fixated on certain ideas to move forward (Choi & Kim, 2017).

The hybrid technique, a new concept to promote innovative idea generation, is receiving attention amid various brainstorming methods. It involves the combination of different cognition stimulation methods, group interaction styles, and external stimuli. The hybrid method helps to prevent productivity loss (Shealy et al., 2018) and emphasizes the fluency, flexibility, and originality of generated ideas (Korde & Paulus, 2017).

Recent literature recommends effective strategies to enhance the production of innovative ideas. The first strategy is to create a group of five to 12 people to ensure effectiveness of the brainstorming sessions (Suzuki et al., 2018). Korde and Paulus (2017) contended that the most effective brainstorming practices involve exactly six participants. The second strategy suggests group members be composed of varied experiences and areas of expertise relevant to the problem at hand to generate significantly more novel ideas (Paulus & Kenworthy, 2019). The third strategy is to elect an environment and exercise preparation for brainstorming sessions (Hidayanti et al., 2018). Supply colorful papers and pencils; provide useful information, such as patent information, during the idea generation phase (Montag-Smit & Maertz, 2017); and view another person's ideas (Korde & Paulus, 2017). The final strategy suggests providing instructions to conduct each idea generation session (Mayseless et al., 2018).

Finally, the idea evaluation phase focuses on evaluating the quality of generated ideas, as measured by fluency (the total number of nonredundant ideas), flexibility (the number of different categories of ideas), and originality (the extent to which ideas are unique or uncommon) (Korde & Paulus, 2017). Good quality of an initial innovative idea often affects the success of the corresponding innovation (Kornish & Hutchison-Krupat, 2017). To ensure the appropriate appraisal and selection of good quality ideas for creating innovation, it is important that nurses have access to comprehensive idea evaluation scales. Thus, learning programs must include activities and tools that can enhance the factors relevant to each idea generation phase.

Learning processes affect the capability of organizational staff to generate ideas (Sutanto, 2017). ELT describes a learning cycle that progresses through concrete experience, reflection, conceptualization, and experimentation (Kolb, 2015). This theory enhances team learning by encouraging learners to participate in group activities. Learners' future actions can benefit from their reflections on previous

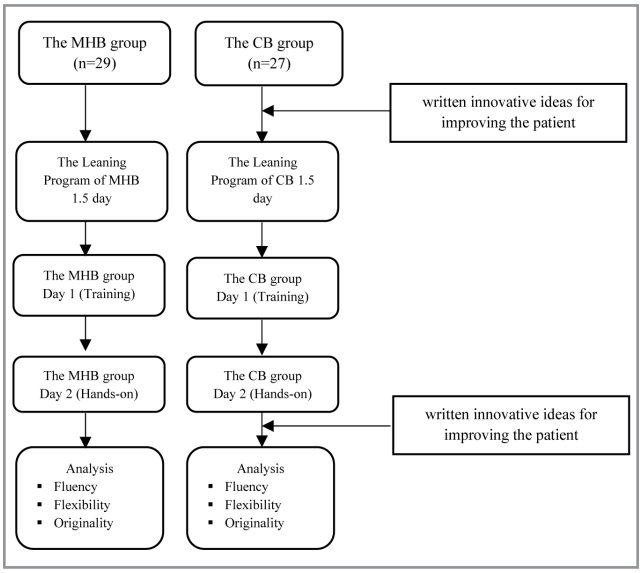


**Figure 1.** Flow chart representing the methodology used for conducting the study. Note. MHB = modified hybrid brainstorming; and CB = conventional brainstorming.

experiences, as individuals can conceptualize new knowledge from observation and experimentation. Creativity is fostered by learning programs that provide a platform for social interactions and an environment that facilitates transforming experiences into new knowledge (Hasan & Koning, 2017). A previous study indicates group learning protocols significantly enhance staff's creative capacity (Mayseless et al., 2018). However, there are few studies that examine learning programs to stimulate cognition and generate innovative ideas among nurses (Ma et al., 2018; Thomas et al., 2016).

This study tested the effectiveness of a modified hybrid brainstorming (MHB) program compared with a CB program regarding the fluency, flexibility, and originality of its innovative idea generation among Thai nurses.

## METHOD

### Study Design

The study employed a pretest–posttest control group design and was conducted between December 2018 and January 2019. Study participants were nurses at a private hospital in Southern Thailand who had been employed for more than 3 years and were able to participate in all program activities. We chose lottery sampling for recruitment and asked the nurse manager to conduct sampling procedures to recruit 60 participants. We provided all participants with a brief explanation of study objectives and program activities and told them they were free to refuse participation at any time without penalty. Participants provided verbal consent, followed by written informed consent. Study approval was provided by the Institutional Review Board of Prince of Songkla University.

### Intervention

**Figure 1** shows a flowchart of the study procedures. To assign 30 participants each into the MHB and CB groups, we input their age, educational level, work experience, work location, and innovative work behavior scores into a minimization program. Four participants were excluded from the study—one from the MHB and three from the CB group—as they could not participate in all proposed activities. Moreover, each group had six participants with a wide range of nursing experience.

The learning program, conducted over 1.5 days, comprised the following activities: program orientation, lecture-related discussions, a group-based idea generation workshop, group critical reflection, and hands-on sessions. Participants in both the MHB and CB groups were trained, but their trainings differed. The first group applied the CB method during the problem identification phase and the MHB method during the idea generation phase, and the second group applied only the CB method. Both the MHB and CB programs (**Table 1**) comprised learning activities based on the idea generation process (O'Loghlin, 2016) and ELT (Kolb, 2015).

### Evaluation

On the first day, before participants started the learning program, we asked them to generate innovative ideas for a specific problem. On the second day, they were asked to generate innovative ideas in a hands-on session. The researchers reviewed the ideas for completeness, coded the data, and submitted all blinded generated ideas to three innovation experts who scored idea fluency, flexibility, and originality.

### Statistical Analyses

We used descriptive statistics and analyzed the frequencies for each variable using a chi-square test, which allowed for between-group comparisons regarding idea fluency, flexibility, and originality. We used independent *t* tests to conduct between-group comparisons for the pre- versus postprogram mean scores. Additionally, we used dependent *t* tests to conduct within-group comparisons for the pre- versus postprogram mean scores. Significance was defined as $p < .05$. The assumption tests, the Shapiro-Wilk test for normality testing and the Levene's test for variance homogeneity were met.

## RESULTS

### Demographic Information

All participants were female nurses. Chi-square tests

TABLE 1

**A BREAKDOWN OF THE LEARNING PROGRAM OF MODIFIED HYBRID BRAINSTORMING (MHB) AND CONVENTIONAL BRAINSTORMING (CB) METHODS[a]**

| The learning program of MHB method | The learning program of CB method |
|---|---|
| Day 1: | Day 1: |
| 1. Welcome and program orientation (15 minutes) | 1. Welcome and program orientation (15 minutes) |
| 2. Lecture-discussion of idea generation process, cognitive stimulating method, and evidence-based practice searching and critical appraisal (45 minutes) | 2. Lecture-discussion of idea generation process, cognitive stimulating method, and evidence-based practice searching and critical appraisal (45 minutes) |
| 3. Problem/opportunity identification workshop with the CB method (90 minutes) | 3. Problem/opportunity identification workshop with the CB method (90 minutes) |
| 4. Ideation workshop with the MHB method (90 minutes) | 4. Ideation workshop with the MHB method (90 minutes) |
| 5. Idea categorization and idea evaluation workshop (90 minutes) | 5. Idea categorization and idea evaluation workshop (90 minutes) |
| 6. Critical reflective practice brainstorming workshop (45 minutes) | 6. Critical reflective practice brainstorming workshop (45 minutes) |
| Day 2: | Day 2: |
| 7. Hands-on (2.5 hours) | 7. Hands-on (2.5 hours) |
| 7.1. Problem/opportunity identification with the CB method (30 minutes) | 7.1. Problem/opportunity identification with the CB method (30 minutes) |
| 7.2. Ideation with the MHB method | 7.2. Ideation with the CB method |
| 7.2.1. Paper-and-pencil individual thinking (8 minutes) | 7.2.1. Face-to-face group thinking (32 minutes) |
| 7.2.2. Paper-and-pencil group thinking (8 minutes) | 7.2.2. 15-minute break |
| 7.2.3. Paper-and-pencil individual thinking (8 minutes) | 7.2.3. Self-learning evidence-based practice (15 minutes) |
| 7.2.4. Paper-pencil group thinking (8 minutes) | 7.2.4. Group-discussion on evidence-based practice (20 minutes) |
| 7.2.5. 15-minute break | 7.2.5. 15-minute break |
| 7.2.6. Self-learning evidence-based practice (15 minutes) | 7.2.6. Face-to-face thinking (30 minutes) |
| 7.2.7. Group-discussion on evidence-based practice (20 minutes) | 7.3. Idea evaluation (30 minutes) |
| 7.2.8. 15-minute break | |
| 7.2.9. Nonverbal group thinking (30 minutes) | |
| 7.3. Idea evaluation (30 minutes) | |

[a] Each method entailed a 1.5-day workshop in the meeting room.

revealed that the MHB and CB groups were not significantly different regarding age ($M$ = 37, $SD$ = 4.62; $t$ = .06, $p$ = .96), educational level ($\chi^2$ = .01, $p$ = .94), work experience ($M$ = 7.82, $SD$ = 3.86; $t$ = -.01, $p$ = .99), work location ($\chi^2$ = .60, $p$ = .44), and innovative work behavior scores ($M$ = 26.41, $SD$ = 5.19; $t$ = -.47, $p$ = .64). However, we found a difference in the pretest scores for fluency and originality, even though we used minimized randomization to minimize the differences among groups. These results might affect from the small sample size.

### Evaluation of Innovative Idea Generation

**Table 2** shows the expert evaluations of the generated ideas' fluency, flexibility, and originality before and after the learning program. After the MHB learning program, mean fluency, flexibility, and originality scores significantly improved. For the CB group, mean fluency and flexibility scores were higher in the postprogram than in the preprogram; however, mean originality scores did not significantly improve. **Table 3** shows between-group comparisons for mean fluency, flexibility, and originality postprogram scores. The MHB group generated ideas with significantly higher fluency and originality scores than the CB group.

## DISCUSSION

The participants were trained in the MHB or CB methods, which were grounded in ELT (Kolb, 2015). Our

TABLE 2

**COMPARISON OF FLUENCY, FLEXIBILITY, AND ORIGINALITY OF THE MODIFIED HYBRID BRAINSTORMING (MHB) AND THE CONVENTIONAL BRAINSTORMING (CB) GROUPS**

| | MHB (*N* = 29) | | | CB (*N* = 27) | | | | |
|---|---|---|---|---|---|---|---|---|
| **Outcome Measure** | ***M*** | ***SD*** | **Range** | ***M*** | ***SD*** | **Range** | ***t*** | ***p*** |
| Fluency | 26.45 | 10.74 | 9-55 | 13.19 | 4.94 | 2-22 | -5.87 | .001 |
| Flexibility | 22.60 | 5.60 | 17-31 | 22.40 | 13.03 | 3-35 | -0.03 | .98 |
| Originality | 16.98 | 9.66 | 5.67-40 | 4.62 | 3.49 | 0-14.33 | -3.24 | .01 |

TABLE 3

**COMPARISON OF FLUENCY, FLEXIBILITY, AND ORIGINALITY PRE- AND POSTPROGRAM BETWEEN THE MODIFIED HYBRID BRAINSTORMING (MHB) AND THE CONVENTIONAL BRAINSTORMING (CB) GROUPS**

| | MHB (*N* = 29) | | | | CB (*N* = 27) | | | |
|---|---|---|---|---|---|---|---|---|
| | **Preprogram** | **Postprogram** | | | **Preprogram** | **Postprogram** | | |
| **Outcome Measure** | ***M* (*SD*)** | ***M* (*SD*)** | ***t*** | ***p*** | ***M* (*SD*)** | ***M* (*SD*)** | ***t*** | ***p*** |
| Fluency | 17.31 (5.90) | 26.45 (10.76) | -5.61 | .001 | 8.07 (4.21) | 13.19 (4.94) | -5.14 | .001 |
| Flexibility | 13.00 (9.00) | 22.60 (5.60) | -3.61 | .022 | 10.8 (4.97) | 22.4 (13.03) | -2.99 | .04 |
| Originality | 9.13 (5.12) | 16.98 (9.66) | -4.67 | .001 | 4.19 (3.21) | 4.62 (3.49) | -0.42 | .68 |

results showed that idea fluency, flexibility, and originality were higher after participants completed the MHB program ($p < .05$). These results are consistent with ELT (Kolb, 2015), which suggests that learning processes comprising the combination/association of varying thought patterns generate more diverse ideas; learning processes comprising one's experiences interacting with one's goals enhance idea generation; and learning processes comprising observation and reflection also enhance idea generation (Kolb, 2015).

The MHB and CB learning programs were dynamic processes that provided different stimuli to help participants change their learning experiences, thereby helping them gain knowledge and subsequently generate better ideas (Kolb, 2015). Additionally, the learning programs comprised activities that relied on open-mindedness and adaptability (Kolb, 2015). It is possible that the group-based reflection session enhanced innovative idea generation because it helped participants split their experiences into parts and categorize them, thereby enabling participants to use these experiences in the program's subsequent hands-on step (Kolb, 2015). Consistent with the study by Pérez et al. (2018), learning and working well with others were significant determinants of innovative competence.

Pérez et al. (2018) reported that providing people with activities that require creativity and critical thinking increases their competency to generate innovative ideas. Our learning program provided participants with a welcoming atmosphere (Bradshaw & Lowenstein, 2014) and made them aware of the knowledge needed and the value of learning. This may have helped participants perform subsequent tasks and address any problems they confronted (Bradshaw & Lowenstein, 2014). The 45-minute lecture-related discussions addressing three to five major lecture points were to help participants better understand which types of knowledge to use during idea generation. The third, fourth, and fifth learning activities were to provide them with experiences in problem and opportunity identification, idea generation, and idea evaluation. The sixth learning activity, group critical reflection, was to encourage participants to consider their concrete experiences from various perspectives and articulate why and how they occurred (Kolb, 2015).

Thus, our findings indicate that, through our proposed learning activities, participants acquired skills that enhanced their creativity (divergent and convergent thinking), practiced a hybrid method of brainstorming within a group of six diverse members, combined two types of group interaction, moderated their idea fixation with access to evidence-based knowledge, and engaged in idea incubation (process information before idea generation). Moreover, the MHB condition comprised different methods, allowing group members to share ideas without productivity loss, social loafing, or evaluation apprehension. Conversely,

the CB condition comprised only one cognitive approach method, which did not specifically prevent productivity loss. Moreover, participants in both groups were required to work with team members who had varied experiences and within time constraints; these factors may explain the enhanced performance and generation of innovative ideas. This assumption is supported by previous research (Korde & Paulus, 2017; Paulus et al., 2015; Wang, 2019), and a previous study showed that group learning amid positive environments may increase people's creativity (Reiter-Palmon, 2018).

Our results also showed that the MHB group generated more fluent and original ideas compared with the CB group, possibly because of the chosen group interaction style, as it was meant to positively influence idea generation. These results highlight that the chosen interaction style provided effective group-based cognitive stimulation, allowing participants to combine individual and group experiences more easily. These assumptions and our results are consistent with previous reports (Kim & Park, 2017; Korde & Paulus, 2017). Another positive aspect of the MHB group was participants' enhanced evidence-based knowledge, with time provided for the unconscious mind to process and associate the information to generate new ideas. These results are in consonance with previous studies (Kim & Park, 2017; Montag-Smit et al., 2017).

However, there was no statistical difference in the mean flexibility scores between the two groups. This result contradicts a previous study (Radel et al., 2015), which found that participants who worked more uninhibitedly generated more flexible ideas. Thus, our results suggest that group interaction style does not influence idea flexibility, which is in line with some previous literature (Korde & Paulus, 2017).

## LIMITATIONS

Although our results produced valid data, this study still had some limitations. First, it was conducted in only one setting (a private hospital in Southern Thailand); thus, our results have limited generalizability, and comparisons with other organizational settings should be made with caution. Second, our study had an inequality of fluency and originality pretest scores and a small sample size that further hindered generalizability. Third, our study was conducted in a hospital meeting room. Compared with more appropriate settings, this context (the participants' work environment) may not have facilitated openness and extensive idea generation and may have inhibited participants' creativity. Fourth, our outcome variables were measured by experts in idea fluency, flexibility, and originality; thus, scores might have varied based on the experts' experiences.

## CONCLUSION

Our proposed 1.5-day learning program with MHB enhances participants' ability to generate more fluent, flexible, and original ideas. The study demonstrates that nurses can generate innovative ideas through MHB programs. Thus, organizations should promote and facilitate such programs to allow nurses to be part of the innovation process.

## REFERENCES


Al-Samarraie, H., & Hurmuzan, S. (2018). A review of brainstorming techniques in higher education. *Thinking Skills and Creativity, 27,* 78–91. https://doi.org/10.1016/j.tsc.2017.12.002

Bradshaw, M. J., & Lowenstein, A. J. (2014). *Innovative teaching strategies in nursing and related health professions* (6th ed.). Jones & Bartlett Learning.

Choi, H. H., & Kim, M. J. (2017). The effects of analogical and metaphorical reasoning on design thinking. *Thinking Skills and Creativity, 23,* 29–41. https://doi.org/10.1016/j.tsc.2016.11.004

Foor, K. L. (2017). *The significance of participation in an innovation training program on the perception of creative behaviors* (Doctoral dissertation, The University of Phoenix). https://search.proquest.com/docview/1958937121?accountid=28431

Hasan, S., & Koning, R. (2017). Conversational peers and idea generation: Evidence from a field experiment. Harvard Business School Strategy Unit Working Paper, 17-36, 1-50. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2964214

Hidayanti, W. I., Rochintaniawati, D., & Agustin, R. R. (2018). The effect of brainstorming on students' creative thinking skill in learning nutrition. *Journal of Science Learning, 1*(2), 44–48. https://doi.org/10.17509/jsl.v1i2.8738

Hocking, I., & Vernon, D. (2017). The right tool for the right task: Structured techniques prove less effective on an ill-defined problem finding task. *Thinking Skills and Creativity, 26,* 84–91. https://doi.org/10.1016/j.tsc.2017.08.001

Kim, W., & Park, J. (2017). Examining structural relationships between work engagement, organizational procedural justice, knowledge sharing, and innovative work behavior for sustainable organizations. *Sustainability, 9*(2), 1–16. https://doi.org/10.3390/su9020205

Kolb, D. A. (2015). *Experiential learning: Experience as the source of learning and development*. Pearson.

Korde, R., & Paulus, P. B. (2017). Alternating individual and group idea generation: Finding the elusive synergy. *Journal of Experimental Social Psychology, 70,* 177–190. https://doi.org/10.1016/j.jesp.2016.11.002

Kornish, L. J., & Hutchison-Krupat, J. (2017). Research on idea generation and selection: Implications for management of technology. *Production and Operations Management, 26*(4), 633–651. https://doi.org/10.1111/poms.12664

Koroh, T. R., Setyosari, P., Degeng, I. N. S., & Dasna, I. W. (2017, May). *The effect of problem solving method vs brainstorming method and learning motivation towards learning outcomes in science.* [Paper presentation.] International Conference on Education, Malang, Indonesia. http://pasca.um.ac.id/conferences/index.php/ice/article/view/120

Lopez, E., Gonzalez, J. L., Cordo, J. A., Janvier-Anglade, M., & Fitzpatrick, T. A. (2019). EntrepreNurses: Nursing's evolving role in innovation strategy. *Nursing Economic$, 37*(3), 159–163. https://search.proquest.com/docview/2243308526?accountid=28431

Ma, X., Yang, Y., Wang, X., & Zang, Y. (2018). An integrative review: Developing and measuring creativity in nursing. *Nurse Education Today, 62,* 1–8. https://doi.org/10.1016/j.nedt.2017.12.011

PMID:29274494
MacFadyen, J. S. (2014). Design thinking. *Holistic Nursing Practice, 28*(1), 3–5. https://doi.org/10.1097/HNP.0000000000000008 PMID:24304625
Mayseless, N., Saggar, M., Hawthorne, G., & Reiss, A. (2018). Creativity in the twenty-first century: The added benefit of training and cooperation. In H. Plattner, C. Meinel, & L. Leifer (Eds.), *Design Thinking Research* (pp. 239–249). Springer. https://doi.org/10.1007/978-3-319-60967-6_12
Misiurek, B. (2016). *Standardized work with TWI: Eliminating human errors in production and service processes*. Productivity Press. https://doi.org/10.1201/b19696
Montag-Smit, T., & Maertz, C. P., Jr. (2017). Searching outside the box in creative problem solving: The role of creative thinking skills and domain knowledge. *Journal of Business Research, 81,* 1–10. https://doi.org/10.1016/j.jbusres.2017.07.021
O'Loghlin, J. (2016). *Innovation is a state of mind: Simple strategies to be more innovative in what you do*. John Wiley & Sons Australia, Ltd.
Paulus, P. B., & Kenworthy, J. B. (2019). Effective brainstorming. In P. B. Paulus & B. A. Nijstad (Eds.), *Handbook of group creativity: Innovation through collaboration* (pp. 287–386). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780190648077.013.17
Paulus, P. B., Korde, R. M., Dickson, J. J., Carmeli, A., & Cohen-Meitar, R. (2015). Asynchronous brainstorming in an industrial setting: Exploratory studies. *Human Factors, 57*(6), 1076–1094. https://doi.org/10.1177/0018720815570374 PMID:25850113
Pérez, M. J., Aznar, L. E., & Fleta, B. M. (2018). Identification and classification of behavioural indicators to assess innovation competence. *Journal of Industrial Engineering and Management, 11*(1), 87–115. https://doi.org/10.3926/jiem.2552
Radel, R., Davranche, K., Fournier, M., & Dietrich, A. (2015). The role of (dis)inhibition in creativity: Decreased inhibition improves idea generation. *Cognition, 134,* 110–120. https://doi.org/10.1016/j.cognition.2014.09.001 PMID:25460384
Reiter-Palmon, R. (2018). *Team creativity and innovation*. Oxford University Press.
Rietzschel, E. F., & Ritter, S. M. (2018). *Moving from creativity to innovation. In Individual Creativity in the Workplace* (pp. 3–34). Academic Press. https://doi.org/10.1016/B978-0-12-813238-8.00001-2
Shealy, T., Hu, M., & Gero, J. (2018). Patterns of cortical activation when using concept generation techniques of brainstorming, morphological analysis, and TRIZ. *In ASME 2018 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference.* American Society of Mechanical Engineers Digital Collection. https://doi.org/10.1115/DETC2018-86272
Sutanto, E. M. (2017). The influence of organizational learning capability and organizational creativity on organizational innovation of Universities in East Java, Indonesia. *Asia Pacific Management Review, 22*(3), 128–135. https://doi.org/10.1016/j.apmrv.2016.11.002
Suzuki, N., Imashiro, M., Shoda, H., Ito, N., Sakata, M., & Yamamoto, M. (2018). Effects of group size on performance and member satisfaction. In S. Yamamoto & H. Mori (Eds.), *International Conference on Human Interface and the Management of Information* (pp. 191–199). Springer. https://doi.org/10.1007/978-3-319-92046-7_17
Thomas, T. W., Seifert, P. C., & Joyner, J. C. (2016). Registered nurses leading innovative changes. *Online Journal of Issues in Nursing, 21*(3), 3. https://doi.org/10.3912/OJIN.Vol21No03Man03 PMID:27856917
Wang, K. (2019). Towards a taxonomy of idea generation techniques. *Foundations of Management, 11(*1), 65–80. https://doi.org/10.2478/fman-2019-0006