

# Movement and Divergent Production

Understanding opportunity for strategic kinesthetic movement during participatory ideation sessions

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Cara J. Miller  
Movement and Divergent Thinking  
Understanding the purpose of strategic kinesthetic  
movement during participatory ideation sessions

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# Abstract

With strategic kinesthetic movement making its way into education and business, and design thinking also edging into those same fields, it seems natural that the two could be integrated and referenced by facilitators who are responsible for leading a group through participatory ideation sessions. Design Thinking is a human-centered innovation process, which ultimately influences innovation and business strategy. It refers to applying a designer's sensibility and methods of problem solving to an innovation process.<sup>1</sup> Designers reach out to stakeholders within an opportunity space through design research methods. Often times, the designer will take on the role of a facilitator and conduct meetings with the stakeholders in order to gather information, generate ideas, or evaluate specific concepts.<sup>2</sup> Facilitated sessions in which all stakeholders have to opportunity to contribute equally are referred to as participatory design process facilitation sessions. Participatory ideation sessions are meetings focused on one stage in a design process; the ideation stage.

This research project is focused on the stage in a human-centered innovation process, referred to as the ideation stage, in which ideas are generated with stakeholders. During participatory ideation sessions, facilitators lead groups of participants through organized and strategized agendas, utilizing design research methods with the sole purpose of generating ideas for improving specified opportunity spaces.<sup>3</sup> Generating ideas with the stakeholders allows the designer to gain insight into the stakeholder's point of view, which ultimately aids the designer in creating a meaningful solution to a design problem. The purpose of this design research project is to develop a framework from which facilitators may gain insight and understanding of how to develop their own participatory ideation sessions utilizing strategic kinesthetic movement customized to specific contexts. The development of these participatory ideation sessions will involve the making and manipulation of generative methods and tools revolving around strategic kinesthetic movement.

Designers working as facilitators utilize movement for many reasons. Movement increases productivity, confidence, creativity, and focus during facilitated sessions. Movement elevates the average body temperature which is a sign of greater blood circulation, which means more oxygen is arriving at the brain, making concentration easier.<sup>4</sup> Movement has also been proven to improve self esteem,<sup>5</sup> potentially enabling participants to contribute more ideas without fear of being judged. The absence of judgment allows for an increase in divergent production during participatory ideation sessions. Divergent production is defined as producing from one's memory storage a number of alternative items of information to meet a certain need, either in exact or in modified form, as in thinking of alternative tools that might be used in opening a package.<sup>6</sup> How might designers harness the power of movement during their facilitated sessions?

# Introduction

Without design research the creative process would not be nearly as meaningful. The main component of design research is gathering data via the constant involvement of the stakeholders. Building relationships and empathy between the design researcher and the stakeholders is key to a meaningful design. The design research approach differs from the strategy of scientific research in that designers are actually striving to achieve understanding through empathy and qualitative data rather than to gain understanding from an objective, and mainly quantitative, standpoint. Designers conduct design research through the use of design research methods and tools. These methods and tools are used in specific ways in order to gather qualitative and quantitative information. The findings enable the designer to discover key insights and opportunities within the data, which informs the design process and outcome. Without understanding the needs, desires, and values of the stakeholders, the designer is blindly walking into a context and offering a solution that may, or may not, address the actual problem. Understanding the context of an individual as well as holistic view allows the designer to get to the root of the problem.

For example, if the designer is told that there is a lack of water in a specific context, design research would not only inform the designer of the problems caused by the lack of water, but also of the problems causing the lack of water. Without researching and asking, “Why is there a lack of water?”, the designer would immediately begin working to bring water to the context, rather than working to solve the root cause of the lack of water. Solving the underlying issue in order to solve all of the issues is likely to yield a more sustainable outcome, as well as a more people-centered outcome. Understanding not only how to bring water to the context, but how to keep water in the context, how the stakeholders will access the water, how the stakeholders will feel about the location of the water, and how the stakeholders will react to the new water system is key to developing the solution. Building relationships with the stakeholders will not only inform the designer of the stakeholder’s needs, desires and values, but will also create the element of empathy and trust between the designer and stakeholders.

The designer may have created a perfect solution to the water issue, but the people may not drink from it for fear that the water is not safe to drink. When the stakeholders have a role in designing the solution, they will understand how it works and trust the solution.

*Designers conduct design research through the use of design research methods and tools. These methods and tools are used in specific ways in order to gather qualitative and quantitative information. The findings enable the designer to discover key insights and opportunities within the data, which informs the design process and outcome.*

Because people are constantly evolving, design research is constantly evolving. Designers must find new ways to explore design research in order to learn how to use it effectively. A designer's understanding of design research is vast and can be very useful during any design situation.

Designers build a knowledge of methods and tools to be used with stakeholders. Understanding how each method and tool works is key to extracting the information that the designer is seeking. Choosing a method or tool for each scenario is important because the method must be appropriate for the context. This is very important when attempting to achieve the goals of building relationships and gathering data because failing to use the methods and tools in the most effective way possible, may result in weak relationships or surface-level data.

Because the contexts in which designers conduct design research are unique to one another, a designer must be adaptable to the context which they are given. This can mean everything from dressing a certain way, to learning how to connect to stakeholders who speak a different language than the designer. Designing methods and tools around the context is a very large part of design research and not exploring design research methods and tools will only narrow the designer's possibilities when conducting research.

Designers may broaden their knowledge of design research through secondary research or primary research. Learning from secondary resources is learning through someone else's experiences of primary resources and learning from primary resources is learning from the original source of information, often the designer's own experiences.

Secondary research offers an outside perspective for the designer. The designer is able to see what others have done in design research. A scholarly journal is an example of a secondary resource that a designer might analyze in order to understand findings from multiple primary sources or someone's opinion on the findings from a primary source.

Primary research offers a more direct perspective for the designer. A case study may be considered a primary resource because the information is coming straight from the people who experienced the case. A designer might look to a case study in order to understand how design research has been used by others, and therefore, how the designer might use design research in the future.

The researcher takes a human-centered approach in which designers reach out to stakeholders within an opportunity space through design research methods. Often times, the designer will take on the role of a facilitator and conduct meetings with the stakeholders in order to gather information, generate ideas, or evaluate specific concepts.<sup>7</sup>

This research project is focused on a type of meeting known as participatory ideation sessions. During participatory ideation sessions, the facilitator leads the group of participants through an organized and strategized agenda, utilizing design research methods and tools with the sole objective of generating ideas on how to improve a specified opportunity space.<sup>8</sup>

Participants are encouraged to think creatively during participatory ideation sessions. J.P Guilford, a psychologist whose work centered around defining and measuring creativity, defined the four most important characteristics of creativity as flexibility (range of categories and themes amongst generated ideas), originality (number of unique ideas), elaboration (amount of detail given) and fluency (total number of ideas).<sup>9</sup> This creative problem solving process is a continuous cycle in which the researcher and participants must work through multiple iterations of both divergent thinking and convergent thinking in order to develop a meaningful outcome. Within the area of divergent thinking, there is divergent production, (the producing from one's memory storage a number of alternative items of information to meet a certain need, either in exact or in modified form, as in thinking of alternative tools that might be used in opening a package<sup>10</sup>), which may be measured through fluency and flexibility.<sup>11</sup> Because this research is focused on participatory ideation sessions, in which the goal is quantity of ideas instead of quality, only the fluency of ideas is relevant to this context.

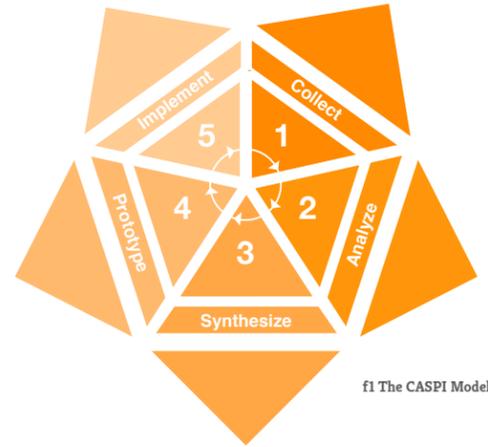
Sam Kaner, a psychologist who studies the facilitator's role in participatory decision making processes, provided four actions associated with divergent thinking. These actions are, "Generating a list of ideas, free-flowing open discussion, seeking diverse points of view, and suspending judgment."<sup>12</sup> One of the most important things which must be stressed by the facilitator during participatory ideation sessions is the importance of demonstrating these divergent thinking skills.<sup>13</sup> After diverging, the group must converge by evaluating ideas generated during the previous diverge session and selecting final possible outcomes to be developed and evaluated further. This project focuses solely on the divergent thinking part of the creative problem solving process and will not be demonstrating the effects of strategic kinesthetic movement within a context of convergence.

## Process Taken

This idea takes the framework of strategic kinesthetic movement from biology, psychology, education and business, and incorporates it into a design thinking context for the designer to manipulate and infuse into an infinite number of design research methods.

In order to accomplish this goal, this project will be completed through the use of a five stage creative problem solving process called, CASPI: Collect, Analyze, Synthesize, Prototype, and Implement. The CASPI process is based off of Hugh Dubberly's Analysis-Synthesis Bridge Model and Vijay Kumar's Kumar Model.<sup>14</sup> Both models borrow concepts from Dr. Min Basadur's Simplex process.

Dubberly's model suggests a process which takes the researcher from Analysis straight to Prototyping and ends with a Synthesized version of the selected concept of "what could be" in the future. In contrast, Kumar's model has an emphasis on synthesis instead of prototyping and ends with a final solution. Dr. Min Basadur's Simplex process covers eight different steps. The eight steps that he includes are: (1) find problems, (2) fact find, (3) problem definition, (4) find ideas, (5) evaluate and select, (6) plan, (7) sell and gain acceptance, and (8) act. Steps 1-3 fall into the first phase called "formulate problem." The next phase, "formulate solution" contains steps 4-5. Steps 6-8 in the final phase of "implement solution."<sup>15</sup> CASPI is the culmination of all three models.<sup>11</sup>



# Research Question

How might **divergent production** during **participatory ideation sessions** be improved **utilizing strategic kinesthetic movement?**

## Definitions

### Strategic Kinesthetic Movement

Specific acts of physical activity such as cross-lateral movement used to facilitate brain activity, enhance creativity and motivate participants.<sup>16</sup>

### Improved

Become better.<sup>17</sup> In this case, a higher divergent production score would be an improvement.

### Divergent Production

Producing from one's memory storage a number of alternative items of information to meet a certain need, either in exact or in modified form, as in thinking of alternative tools that might be used for opening a box.<sup>18</sup>

### Participatory Ideation Sessions

Meetings in which a facilitator leads a group of participants through an organized and strategized agenda, utilizing design research methods with the sole purpose of generating ideas on how to improve a specified opportunity space.<sup>19</sup>

How might we utilize strategic kinesthetic movement in order to encourage divergent production during participatory ideation sessions?

## Sub-Questions

1. Which strategic kinesthetic movements are proven to encourage creativity and divergent production?
2. How might generative design research methods infused with strategic kinesthetic movement be integrated into the part of participatory ideation sessions in which divergent production is encouraged?
3. How might generative design research methods infused with selected kinesthetic movements be evaluated in terms of how well they encourage divergent production in participants during participatory ideation sessions?
4. How might designers and non-designers come to understand how to integrate the movements into their own methods and participatory ideation sessions?

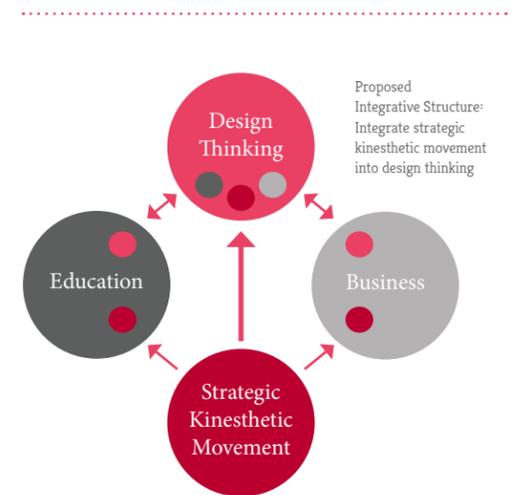
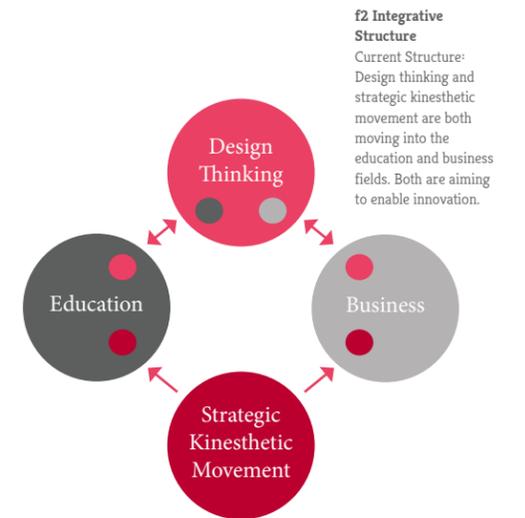
# Justification

With strategic kinesthetic movement making its way into education and business, and design thinking also edging into those same fields, it seems natural that the two should be integrated and referenced by facilitators who are responsible for leading a group through participatory ideation sessions.<sup>12</sup>

Design Thinking is a human-centered innovation process which ultimately influences innovation and business strategy. It refers to applying a designer’s sensibility and methods of problem solving.<sup>20</sup> Designers reach out to stakeholders within an opportunity space through design research methods. Often times, the designer will take on the role of a facilitator and conduct meetings with the stakeholders in order to gather information, generate ideas, or evaluate specific concepts.<sup>21</sup>

This research project is focused on the step in a human-centered innovation process in which ideas are generated with stakeholders. During participatory ideation sessions, the facilitator leads the group of participants through an organized and strategized agenda, utilizing design research methods with the sole purpose of generating ideas on how to improve a specified opportunity space.<sup>22</sup> One of the most important things which must be stressed by the facilitator during participatory ideation sessions is the importance of demonstrating divergent thinking skills.<sup>23</sup> The main characteristics of divergent thinking are defined by J.P Guilford, a psychologist whose work centered around defining and measuring creativity and divergent thinking. Guilford defined the three most important characteristics of divergent thinking as flexibility (range of categories and themes amongst generated ideas), originality (number of unique ideas) and fluency (total number of ideas).<sup>24</sup> Within the area of divergent thinking, there is divergent production, (the producing from one’s memory storage a number of alternative items of information to meet a certain need, either in exact or in modified form, as in thinking of alternative tools that might be used in opening a package<sup>25</sup>), which may be measured through fluency and flexibility.<sup>26</sup> Because this research is focused on participatory ideation sessions, in which the goal is quantity of ideas instead of quality, only the fluency of ideas is relevant to this context.

Along with these three things, Sam Kaner, a psychologist who studies the facilitator’s role in participatory decision making processes, provided four actions associated with divergent thinking. These actions are, “Generating a list of ideas, free-flowing open discussion, seeking diverse points of view, and suspending judgment.”<sup>27</sup>



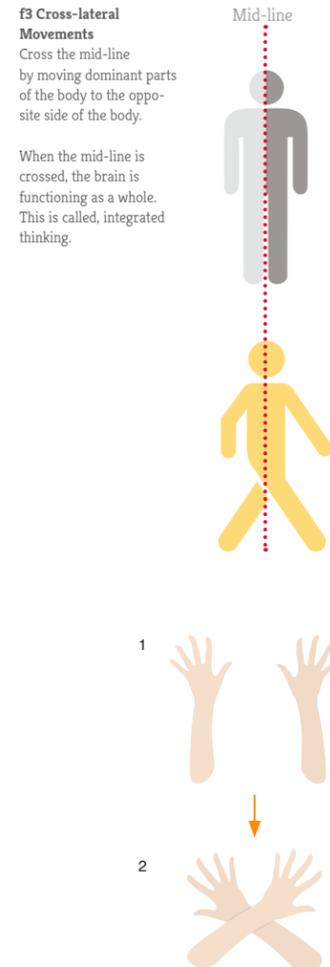
Divergent thinking is the opposite of convergent thinking, which Kaner describes as, “Sorting ideas into categories, summarizing key points, coming to agreement, and exercising judgment.”<sup>28</sup> This research project is only focused on the portion of participatory ideation sessions in which divergent thinking is being exercised.

In design thinking, movement has become a popular way to enable divergent thinking during facilitated sessions. Facilitators utilize movement for many reasons. One reason is that movement has been proven to increase productivity, creativity, and focus in the classroom and in the business world. Moving elevates the average body temperature which is a sign of greater blood circulation, which means more oxygen is arriving at the brain, making concentration easier.<sup>29</sup>

Movement has also been proven to improve self esteem,<sup>30</sup> which would enable participants to contribute more ideas without fear of being judged. There are specific movements which may be utilized strategically during facilitated sessions in order to enhance divergent thinking. These movements are referred to as strategic kinesthetic movements.

One type of these movements are called cross-lateral movements. Cross-lateral movements activate both sides of the brain simultaneously by moving dominant parts of the body across the mid-line to the opposite side of the body, resulting in good communication between the left and right hemispheres.<sup>31</sup> When both hemispheres of the brain are functioning simultaneously, it is known as integrated thinking. Integrated thinking is the key to higher level reasoning and creativity.<sup>31</sup> The more creative one is, the more likely the two sides of the brain are in easy communication with each other.<sup>32</sup>

Some examples of cross-lateral activities include basic scarf juggling, elephant walks, windmills, and rhythm ribbons.<sup>33</sup> Other forms of brain-enhancing activities are tracking activities (in which eyes move to follow something), and rhythmic movements (tapping feet or marching to a beat).<sup>34</sup> This research project will focus only on cross-lateral movements and rhythmic movements as primary forms of strategic kinesthetic movement.



Because divergent production is an essential component of creativity, it stands to reason that if creativity is enhanced, so is divergent production.

There is a gap in educational systems throughout the United States. Educators are recognizing the student’s need for movement while at the same time, physical education programs are either being reduced or cut out of the system.<sup>35</sup> Therefore, teachers must incorporate movement into their daily lesson plans. Research on plasticity, as well as brain research in general, tells us that the body and mind are completely interconnected. When a person is appropriately engaged in a complex experience, multiple body/brain/mind systems are integrated focused and working together naturally.<sup>36</sup> In a classroom setting, students may be led through cross-lateral movements by the teacher. In this case, the teacher takes on the role of facilitator.

A similar gap is seen in business, where offices are designed similar to library study areas rather than areas that can enable a collaborative community. The people working in these areas often recognize this gap and their, subtle plea for movement, and try to change their workplace into a playspace, enabling collaboration and creativity.<sup>37</sup> The possibility of collaboration in these business environments increases because movement may be utilized as a tool to create a safe environment in which fear of being judged by other participants drastically decreases.<sup>38</sup> Therefore using strategic kinesthetic movement during an ideation session is expected to increase the level of participation during activities in which divergent thinking is encouraged.

In a study done during a one-day Switched-On Selling seminar by Brain Gym®, (One of the leading brain-based education programs incorporating strategic kinesthetic movement), a questionnaire was completed by participants. The participants completed the survey once before the seminar and once at the end of the seminar, which operated through a system of cross-lateral movement.

On the statement “I handle rejection well,” the number of salespersons in disagreement dropped from 56% at the beginning of the seminar to only 8% at the conclusion.<sup>39</sup> This proves that movement increases the ability to think both divergently and convergently because it demonstrates that the participant is able to handle judgment when it is not appropriate, (during divergent exercises), and when judgment is encouraged, (during convergent exercises).

Divergent thinking and convergent thinking are the two defining pieces of the innovation process, a process which businesses are trying utilize in order to explore new ideas and possibilities within their company. Roger Martin wrote of the balance businesses must achieve between exploration and exploitation. If a company exploits one idea over and over again, it will exhaust the interest of the customer. But if the company has a balance between exploring new ideas and exploiting them, they will be able to constantly re-invent their image and appeal to new customers. Finding the balance is design thinking.<sup>40</sup>

With strategic kinesthetic movement making its way into education and business, and design thinking also edging into those same fields, it seems natural that the two should be integrated and referenced by facilitators who are responsible for leading a group through participatory ideation sessions. Cross-lateral movement and design thinking are linked through creativity. Cross-lateral movements may be integrated into generative design research methods during the creative problem solving process, (specifically participatory ideation sessions), as they enhance divergent production.

What if designers were to utilize the movements which are proven to increase brain function, creativity, motivation, and focus strategically throughout their ideation sessions? This idea takes the framework of strategic kinesthetic movement from neurology, psychology, education and business, and incorporates it into a design thinking context for the designer to manipulate and infuse into an infinite number of design research methods.

# Limitations

The focus of this research project will be within the context of divergent thinking during participatory ideation sessions. This research project will explore the possibilities of incorporating strategic kinesthetic movement, mainly cross-lateral movement and rhythmic movement, into facilitated ideation sessions. It is important to note that these movements are grounded in psychological, educational and business research. Centering around enhancing divergent production, these methods for ideation with incorporated strategic kinesthetic movement may be utilized by both designers and non-designers during ideation sessions. Therefore, research will work on a meta-design level and a non-design level. These methods will be tested with facilitators and participants in ideation sessions in order to understand how well each of the proven movements works and how the movements engage participants and enhance divergent thinking.

As stated previously, divergent thinking is made up of three main principles: fluidity, flexibility and originality.<sup>41</sup> Because the goal of each participatory ideation session is to generate as many ideas as possible instead of high quality ideas, divergent production will be measured on fluency. Fluency will be observed and calculated after each participatory ideation session that will be facilitated by the researcher. The researcher will also be using design research methods to collect qualitative data concerning the stakeholders, (Facilitators and participants). These methodologies will lend understanding to the impact of the movements through specific methods and why these methods are, or are not, impactful. Gaining an understanding of why specific integrated methods are impactful will allow the researcher to make suggestions as to how to incorporate strategic kinesthetic movement into design research methods, and why it is meaningful to do so.

This research project is focused on engaging the participants, and not choosing participants with whom to engage. Therefore, these methods may be tested on anyone and it is left up to the designer or facilitator to decide which methods are appropriate for their participants during the planning of their ideation sessions.

This study will include participants who are familiar and unfamiliar with the concept of participatory ideation, and divergent thinking. This will allow the researcher to test the movements with people who are used to being creative in a group setting and people who are unfamiliar to being creative in a group setting. Understanding which movements work best with different groups will enable the researcher to make suggestions to the facilitator in regards to planning participatory ideation sessions.

Although research has found that cross-lateral movement and other strategic kinesthetic movements may also increase skills such as reading, writing, and motivation, this research project is focused only on one of the skills these movements are said to enhance; creativity.

The theory of strategic kinesthetic movement is not embraced by all. There are some researchers who still do not believe in the effects of strategic kinesthetic movement. One of these researchers, Ian Diamond, Chief Executive of The Economic and Social Research Council in the UK, acknowledges that there are many programs attempting to bring neurology into education and states that there is a mixture of programs which are well researched and some who aren't. He warned against the programs whose claims cannot be traced back to grounded scientific evidence.<sup>42</sup>

The result of this study will focus on creating a theoretical framework for understanding the benefit of being intentional with movement during times in which divergent thinking skills are being used, as well as offer suggestions on how to incorporate strategic kinesthetic movement into design research methods for the purpose of ideation.

Research is conducted from the designer and facilitator perspective, and therefore insights will be formed from surrounding skills and knowledge. Designers are able to fluctuate from viewing the context from an insider's point of view, to an outsider's point of view. This allows the designer to identify unbiased insights within the research data, as well as approach the research methodology in a way, which recognizes multiple perspectives. This will be of use throughout the research process and when results are being constructed.

# Project Description and Research

The goal of a participatory ideation session is for the participants to work together to generate as many ideas for solutions to their defined problem as possible within a limited time span. The facilitator is responsible for bringing the participants through an efficient generative process, which allows all of the participants to contribute their ideas and build off of each other's ideas. In order to do this, the facilitator must take into account the amount of time that they have compared to the amount of ideas they need the participants to generate in order to be able to move on to the next stage in the process. Therefore, the facilitator must possess a detailed knowledge and understanding of the elements that may encourage or impede divergent production.

Divergent production, as defined by J.P. Guilford, is producing from one's memory storage a number of alternative items of information to meet a certain need, either in exact or in modified form.<sup>43</sup> Divergent production is measured by fluency, the number of ideas one produces.<sup>44</sup> The efficiency of a method may be calculated by dividing fluency over minutes spent generating. For example, if a participant generated 60 ideas in 5 minutes, they were generating at a rate of 12 ideas per minute. A facilitator's job during a participatory ideation session is to lead the participants through a generative process with a high divergent production rate.

During this process, it is important that the participants feel comfortable within the group. When participants feel comfortable in their environment, they tend to participate more. Along the same lines as comfort, self-confidence is very important to the process because if a participant is not confident in their ideas, they may judge their own ideas, prohibiting that participant from sharing. The third major factor that influences divergent production within a participatory ideation session, which is judgment. Judgment of one's self or others may impede divergent production because it causes participants to feel uncomfortable and lose confidence in their ideas. When participants feel judged, they question their value to the group and may decide that their ideas are not good enough to contribute. Therefore, when judgment increases, comfort and confidence decrease causing fluency to decrease.<sup>45</sup>

While general movement does encourage creativity, focus, motivation, comfort, self-esteem and deferral of judgment, there are certain movements identified by psychologists, biologists, and teachers that have been proven to have more of an affect than others. This project will focus on two of the main types of movement.

The first is cross-lateral movement. Cross-lateral movements activate both sides of the brain simultaneously by moving dominant parts of the body across the mid-line to the opposite side of the body, resulting in good communication between the left and right hemispheres.<sup>12</sup> When both hemispheres of the brain are functioning simultaneously, it is known as integrated thinking. Integrated thinking is the key to higher-level reasoning and creativity.<sup>46</sup> The more creative one is, the more likely the two sides of the brain are in easy communication with each other.<sup>47</sup> Some examples of cross-lateral activities include basic scarf juggling, elephant walks, windmills, and rhythm ribbons.<sup>48</sup>

The other brain-enhancing movements this study will feature are rhythmic movements, (tapping feet or marching to a beat)<sup>49</sup> Because divergent thinking is an essential component of creativity, it stands to reason that if creativity is enhanced, so is divergent thinking. In order for divergent thinking to be present, divergent production must be occurring. Therefore, if these movements are proven to enhance creativity, they must also encourage divergent production.

This project focused on determining how these proven movements work within the context of a participatory ideation session, when they work best, who they work best with, how they work, and why they work. The researcher took a participatory design research approach in which qualitative and quantitative methods were used to interact with participants, collect data, analyze information, synthesize findings, and design the final solution.

## Process

This project was completed through the use of a five stage creative problem solving process called, CASPI: Collect, Analyze, Synthesize, Prototype, and Implement.<sup>14</sup>

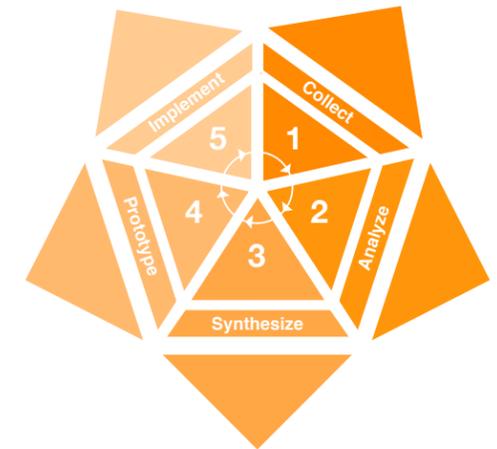
The first phase in this design research project is **Collect**. During the collection phase, a series of design research methods and tools were selected by the researcher in order to complete certain goals within this design research project. The main objective of the collection phase is to gain an understanding of the context, as well as to build relationships with the people involved in the project.

The second phase in this design research project is **Analyze**. The main objective of the Analysis phase is to dissect the information obtained during the previous phase, Collection, in order to gain an in-depth understanding of the context. Breaking down all of the data into understandable and manageable pieces of useful information allowed the designer identify meaningful patterns within the data.

The third phase in this design research project is **Synthesize**. The main objective of the Synthesis phase is to use what was learned during the previous phase, Analysis, in order to generate ideas for possible solutions. The main question the designer asked herself during this phase was, “What could be?” Once key insights were identified, the designer was able to begin imagining what form these results might take.

The fourth phase in this design research project is **Prototype**. The main objective of the Prototype phase is to bring what was decided during the previous phase, Synthesis, into a more tangible reality so that the ideas may be evaluated and improved upon before implementation. The main question the designer asked herself during this phase was, “How could it be better?” Ideas became reality through several rounds of both lo-fi and digital prototypes.

The final phase in this design research project is **Implement**. The main objective of the Implement phase is to bring the final prototype to life. The idea that was selected as a prototype becomes the final solution by being put into action by the designer.



14 CASPI Model

## Research Strategy

Before involving people in this participatory design research project, secondary research was done in order to understand the parameters of the opportunity space. The researcher gathered information about strategic kinesthetic movement in schools and businesses. She studied cross-lateral movements and rhythmic movements and began to understand how they may be integrated into participatory ideation sessions.

In order to begin the core of the research, the stakeholders were identified as facilitators and participants. Facilitators and participants were all given a questionnaire to assess their current feelings toward working in a group, their own creative skills, and how confident they feel sharing their ideas with other people. Twenty stakeholders were then selected to be participants in this research project.

The twenty selected represented a variety of people, students, teachers, facilitators, designers, non-designers, and business owners and managers. The twenty participants were then split into four equal groups of five people based on their experiences, comfort in groups, confidence in their creative skills, geographical location, and familiarity with collaborative creative problem solving.

Each group was taken through two separate participatory ideation sessions; a session in which kinesthetic movement was not used strategically, and a session in which strategic kinesthetic movement was used. While two groups experienced the session with no strategic kinesthetic movement first, the other two groups first experienced the session including strategic kinesthetic movement. This was the first round of research involving the participatory ideation sessions.

During the second round, the groups switched and the groups who had previously participated in a session without strategic kinesthetic movement were now participating in a session involving strategic kinesthetic movement, and vice versa. The purpose of this is to control the skewing of results based on repetition. Repetition in this case refers to the exposure to ideation that the groups are experiencing. The more practiced participants are, the better they are expected to perform during a participatory ideation session.

During the Collection phase, the researcher created a research plan which would yield both qualitative and quantitative data. This was an important element of the research plan because the researcher was planning to measure the number of ideas generated, why they were easy or difficult to generate, and what that means in relation to the focus area. Due to the nature of this focus area, the research plan was structured as a comparative study. There were twenty participants during this first round of collection. Twelve of the twenty considered themselves to be designers or work in a creative field. The rest of the participants were not working in what they would consider a creative field.

The group of twenty was split into four small groups of five.<sup>15</sup> This provided the researcher with four different sets of data to compare. Creating smaller groups also made the participatory ideation sessions more manageable for the researcher in that she was able to take photographs, video, keep time, and capture answers in a more efficient way. Groups were chosen based on geographical location, occupation, existing relationships, and availability.

**Participatory Ideation Session Research Plan**

		Round 1	Round 2
20 Participants- 5 per group	Group 1A 	Participatory Ideation Session <i>Without</i> Strategic Kinesthetic Movement	Participatory Ideation Session <i>With</i> Strategic Kinesthetic Movement
	Group 1B 	Participatory Ideation Session <i>Without</i> Strategic Kinesthetic Movement	Participatory Ideation Session <i>With</i> Strategic Kinesthetic Movement
	Group 2A 	Participatory Ideation Session <i>With</i> Strategic Kinesthetic Movement	Participatory Ideation Session <i>Without</i> Strategic Kinesthetic Movement
	Group 2B 	Participatory Ideation Session <i>With</i> Strategic Kinesthetic Movement	Participatory Ideation Session <i>Without</i> Strategic Kinesthetic Movement

F5 Participatory Ideation Session Research Plan

Two of the four groups of participants each completed one participatory ideation session which did not include strategic kinesthetic movement. The other two groups began this project with participatory ideation sessions designed to include strategic kinesthetic movement. This structure provided a comparative study and a reverse comparative study. This was necessary because any increase in amount of ideas generated could be brought on by exposure and repetition rather than the strategic kinesthetic movement.

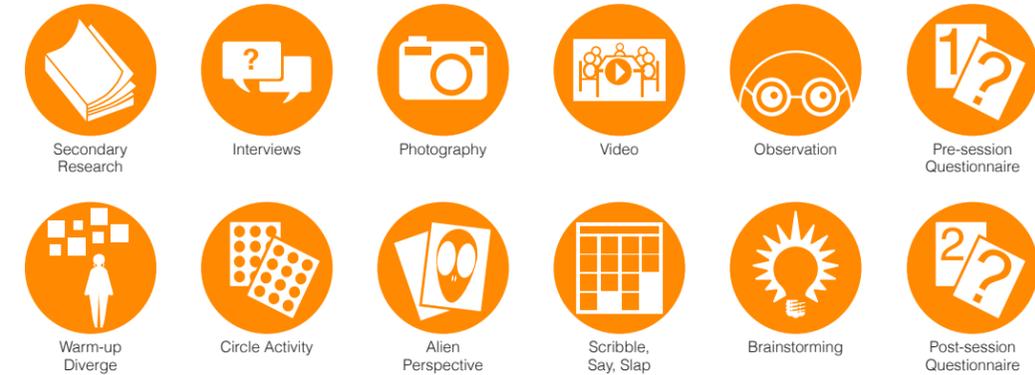
Each participatory session was structured in a way which allowed participants to ease into participating. The researcher chose methods that ranged from an individual activity, to a whole group activity. Methods that required little or no communication with other group members were introduced first. The purpose of this was to introduce participants to the act of diverging on their own. Allowing participants to practice on their own enabled them to get used to the thought of sharing ideas with the group. Methods introduced early also required less movement from the participants and took place while the participants stayed seated. This is contrasted by methods used later in the session, which required participants to be standing and moving their whole body.

Working from inactive to interactive methods gave the participants time to get to know each other, get used to each other, and become more comfortable with sharing their ideas. This strategy is reflective of how sessions are designed by professional design facilitators.

Methods chosen by the design researcher were often deployed more than once during this project due to the iterative nature of the creative problem solving process being used. Each method was chosen carefully by the design researcher in an effort to choose methods appropriate to the specific goals that needed to be achieved. Each stage of CASPI called for different methods to accommodate different objectives.

## Methods

### Collect



### Analyze



### Synthesize

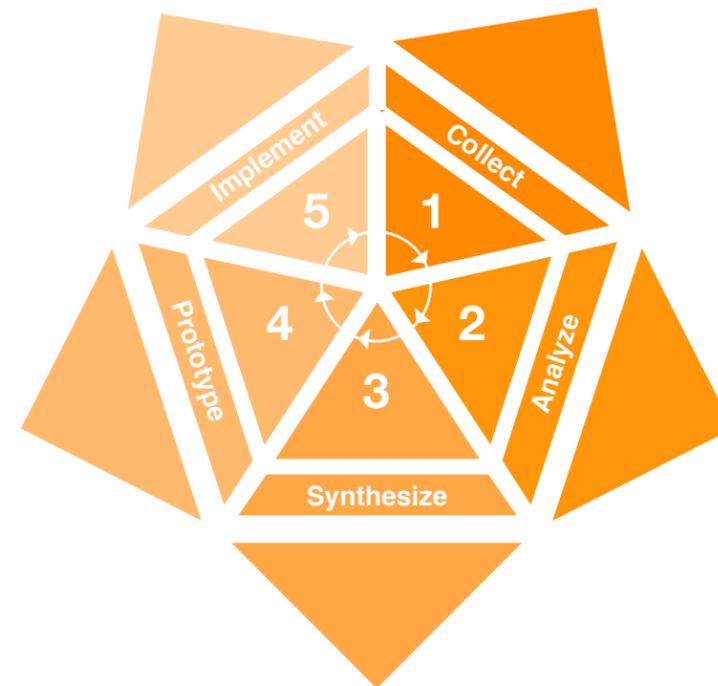


### Prototype



## Research and Results

This section will provide details of each step in the CASPI process. This includes the methods that were implemented by the researcher, outcomes of those methods, and insights or conclusions drawn from each phase in the process.



## Collect

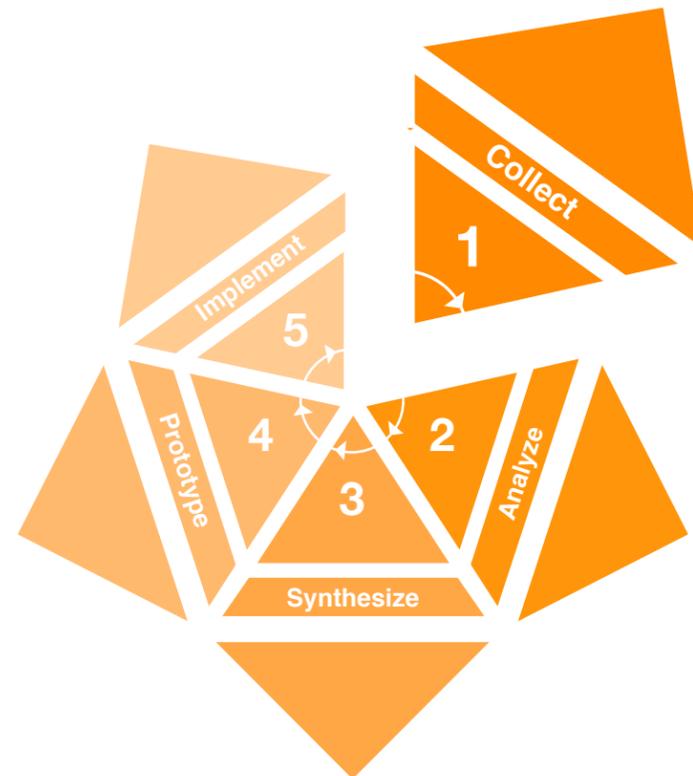
The first phase in this design research project is Collect. During the collection phase, a series of design research methods and tools were selected by the researcher in order to complete certain goals within this design research project. The main objective of the collection phase is to gain an understanding of the context, as well as to build relationships with the people involved in the project. This is a very important step because building strong relationships with participants will enable the researcher to gain insight into the participant's perspective. Understanding the context from the participant's perspective is incredibly important during this people centered process because it allows the participant to feel that their opinion is valuable to the process.

***Strong relationships with the participants are the foundation of a meaningful and intentional design research project.***

In order to make decisions about which methods should be used, the researcher broke the collection phase into three stages. These stages were:

1. Preliminary Research
2. Documentation
3. Participatory Ideation Sessions:
  - Sessions **Excluding** Strategic Kinesthetic Movement
  - Sessions **Including** Strategic Kinesthetic Movement

Each stage within the collection phase contains goals that were reached through the researcher's use of design research methods and tools. The following pages describe the stage and goals of each stage, as well as the methods used in each stage.



## 1. Preliminary Research

Research done prior to the deployment of the participatory ideation sessions. This stage allowed the researcher to gain understanding of the current state of each area of study involved in the research question. Information gathered during this stage informed the designer's decisions regarding the process of this project. Information was primarily gathered through secondary research and interviews with facilitators and possible participants.



### Secondary Research

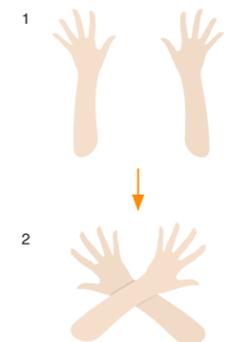
The researcher started the collection phase by conducting secondary research in order to learn more about the chosen problem space and contexts. The researcher looked through books, articles, and studies in order to develop a higher understanding of participatory ideation sessions, the use of movement during group activities, which movements were most commonly used and why, and factors that hinder or contribute to divergent production. It was during this stage in the collection phase that the researcher answered the first of four sub-questions.

#### ***Which strategic kinesthetic movements are proven to encourage creativity and divergent production?***

Movement has been proven to increase productivity, creativity, and focus in the classroom and in the business world. Moving elevates the average body temperature which is a sign of greater blood circulation, which means more oxygen is arriving at the brain, making concentration easier.<sup>50</sup> Movement has also been proven to improve self esteem,<sup>51</sup> which would enable participants to contribute more ideas without fear of being judged. There are specific movements which may be utilized strategically during facilitated sessions in order to enhance divergent production.

One type of these movements are called cross-lateral movements.<sup>16</sup> Cross-lateral movements activate both sides of the brain simultaneously by moving dominant parts of the body across the mid-line to the opposite side of the body, resulting in good communication between the left and right hemispheres.<sup>12</sup> When both hemispheres of the brain are functioning simultaneously, it is known as integrated thinking. Integrated thinking is the key to higher level reasoning and creativity.<sup>52</sup> The more creative one is, the more likely the two sides of the brain are in easy communication with each other.<sup>53</sup> Some examples of cross-lateral activities include basic scarf juggling, elephant walks, windmills, and rhythm ribbons.<sup>54</sup>

Other forms of brain-enhancing activities are tracking activities (in which eyes move to follow something), and rhythmic movements (tapping feet or marching to a beat).<sup>55</sup> For the purposes of this design research project, the researcher studied all three of these techniques and chose to study them more closely through live action research, (using the movements with participants).



f6 Cross-lateral Movements

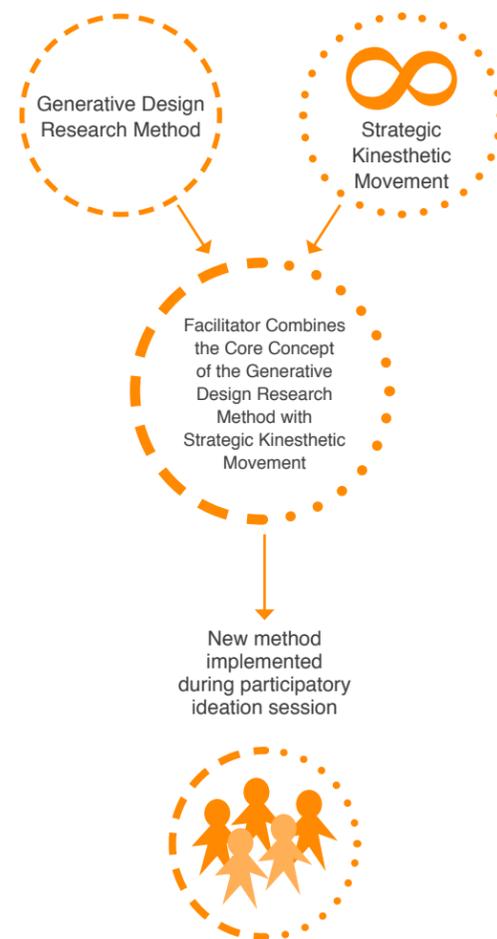
Because divergent thinking is an essential component of creativity, it stands to reason that if creativity is enhanced, so is divergent thinking. Along that same line of logic, the researcher deduced that because divergent production is a core component of divergent thinking, it also stands to reason that movement would improve the divergent production amongst participants during participatory ideation sessions.

Divergent production presents itself in the form of ideas and may be measured by *fluency*, (number of ideas produced), and *flexibility*, (number of different categories amongst ideas produced).<sup>56</sup> Since the goal of a participatory ideation session is to generate as many ideas as possible and the desired outcome of the sessions is *quantity*, not *quality*, this research project will only be looking at fluency as a factor in measuring divergent production as it pertains to participatory ideation sessions. Facilitators commonly struggle to get the most out of a participatory ideation session due to a time limit. If the fluency increased amongst participants, the session would become more efficient because the participants would be generating more ideas per minute. The rate of divergent production would improve, and therefore, the efficiency of the participatory ideation session would improve.

In order to test these theories, the researcher decided to facilitate participatory ideation sessions in which the strategic kinesthetic movements were integrated. After looking through several studies, the researcher decided that the best way to integrate the movements was to infuse the design research methods commonly used amongst design facilitators with the strategic kinesthetic movements. She did this by taking the core concept of the chosen generative design research method and combined it with one or both types of strategic kinesthetic movement. The methods were then used during the participatory ideation sessions.<sup>17</sup>

The designer developed a cross study in which participants each participated in two different sessions; a session with strategic kinesthetic movement, and a session without strategic kinesthetic movement. A cross study was selected as a solution to the possibility that participants may just produce more ideas because they are familiar with the divergent process or with the prompts given during the ideation sessions.

f7 The integration of a generative design research method and strategic kinesthetic movement.



In order to ensure an equal opportunity for ideation in each prompt, the designer researched difficulty levels of prompts. Prompts given to facilitate ideation during each participatory ideation session were decided based on the research of Wallach and Kogan. Wallach and Kogan collectively studied creativity and developed several tests used to measure creativity and divergent production. Wallace and Kogan also give examples of prompts used during their tests and chosen because they were of the same level of difficulty.

There are four prompts used to encourage divergent production: 1. What are the uses for a selected object; 2. Name things that do a selected action; 3. Name things with a certain attribute; 4. A page of empty circles asks the participant to turn each circle into something different.<sup>57</sup>

The researcher used these prompts during each ideation session along with objects, actions, and attributes used in studies that also worked from Wallach and Kogan's research. Each participatory ideation session has been detailed in the, "Participatory Ideation Sessions" stage of the "Collect" phase.

Once the researcher had decided on movements, methods, and prompts, the next step was to find participants.



### Interviews

As stated earlier, the stakeholders were identified as facilitators and possible participants. Facilitators were able to see how the sessions work from the planning stages to the actual participatory ideation sessions. They were able to think about how they would integrate strategic kinesthetic movements into their own facilitated sessions and offered insight into how the sessions might run smoother. Possible participants are anyone willing to participate in a participatory ideation session. For this research project, the designer made sure to interact with a variety of people in order to gain multiple perspectives.

Before the participatory ideation sessions could take place, the researcher had to find participants who were willing to commit to two participatory ideation sessions over the course of a few weeks.

Facilitators and participants were all given an interview, either in person or over the phone, to assess their current feelings toward working in a group, their own creative skills, and how confident they feel sharing their ideas with other people. Twenty stakeholders were then selected to be participants in this research project.

The twenty selected represented a variety of people, students, teachers, facilitators, designers, non-designers, and business owners and managers. **The twenty participants were then split into four equal groups of five<sup>68</sup>** people based on their experiences, comfort in groups, confidence in their creative skills, geographical location, and familiarity with collaborative creative problem solving.

Interviews were also done with facilitators in order to understand how they utilize movement in their sessions or if they utilize movement. Facilitators were also asked which methods they tended to use most during their participatory ideation sessions. This information helped shape the research strategy for this project.

### Participatory Ideation Session Research Plan

		Round 1	Round 2
20 Participants - 5 per group	Group 1A 	Participatory Ideation Session <i>Without</i> Strategic Kinesthetic Movement	Participatory Ideation Session <i>With</i> Strategic Kinesthetic Movement
	Group 1B 	Participatory Ideation Session <i>Without</i> Strategic Kinesthetic Movement	Participatory Ideation Session <i>With</i> Strategic Kinesthetic Movement
	Group 2A 	Participatory Ideation Session <i>With</i> Strategic Kinesthetic Movement	Participatory Ideation Session <i>Without</i> Strategic Kinesthetic Movement
	Group 2B 	Participatory Ideation Session <i>With</i> Strategic Kinesthetic Movement	Participatory Ideation Session <i>Without</i> Strategic Kinesthetic Movement

f8 Participatory Ideation Session Research Plan

## 2. Documentation

Methods of documenting the research project from start to finish. Documenting allowed the researcher to revisit and reflect upon information gathered during this project. Information gathered and ingested was then used to inform the design researcher's decisions regarding the next steps of this design research project.

The researcher took an ethnographic approach to documentation. Ethnography is a type of research rooted in anthropology that looks at the links between culture and human behavior. These research observations describe people based on thought, behavior, and actions.<sup>58</sup> During each session the researcher had a photographer to take photos of the stakeholders. A video camera captured each session for later review. The researcher engaged in observational research and took notes of what she observed during each session.



### *Photography*

The researcher used photography to document the design research process as well as to capture moments during the participatory ideation sessions to be used later. During each session, the researcher enlisted the help of a photographer to take photos of the participants, herself facilitating, and each method in action.



### *Video*

The researcher recorded each session for future reference and analysis. This allowed the researcher to identify any behavioral changes amongst participants during each session, as well as identify behavior or mood changes when the sessions were compared. Video also gave the researcher a way to review the sessions for factors that might have developed with the introduction of strategic kinesthetic movement.



### *Observation*

During the participatory ideation sessions, the designer observed the participants and took note of anything that may have contributed to the research. By watching the participants during each activity, the researcher was able to see which activities were more difficult than others, who was struggling, who was thriving, when a supplement prompt may have been appropriate, and mood and behavior changes such as sudden enthusiasm or a sudden willingness to contribute more ideas to a group diverge.

### 3. Participatory Ideation Sessions

As previously stated, the researcher put the strategic kinesthetic movement into the context of participatory ideation sessions in order to discover the affect that the movements had on participants. All four groups of participants in a session without strategic kinesthetic movement and a session that included strategic kinesthetic movement. Two groups participated in the session without strategic kinesthetic movement prior to the session with strategic kinesthetic movement, while the other two groups participated in the sessions including strategic kinesthetic movement prior to the session without strategic kinesthetic movement. This structure provided a comparative study and a reverse comparative study. This was necessary because any increase in amount of ideas generated could be brought on by exposure and repetition rather than the strategic kinesthetic movement.



Researcher beginning the participatory ideation session with an introduction to the research project. This was the setting for 4 of the sessions.

Each participatory session was structured in a way which allowed participants to ease into participating. The researcher chose methods that ranged from an individual activity, to a whole group activity. Methods that required little or no communication with other group members were introduced first. The purpose of this was to introduce participants to the act of diverging on their own. Allowing participants to practice on their own enabled them to get used to the thought of sharing ideas with the group. Methods introduced early also required less movement from the participants and took place while the participants stayed seated. This was contrasted by methods used later in the session involving strategic kinesthetic movement, which required participants to be standing and moving their whole body.

Working from inactive to interactive methods gave the participants time to get to know each other, get used to each other, and become more comfortable with sharing their ideas. This strategy is reflective of how sessions are designed by professional design facilitators.

The researcher deployed a questionnaire prior to each participatory ideation session, and a questionnaire after each participatory ideation session in order to gain qualitative data about each participants feelings at those times. A warm-up was also used at the beginning of each session in order to encourage the participants to begin thinking divergently. Using warm-ups which called for divergent production primed the participants with the knowledge and skills necessary to complete the rest of activities involved in each session. These methods do not change between each session.



#### *Pre-session Questionnaire and Post-session Questionnaire*

Participants were asked to answer questions about their experiences both prior to and after the divergent portions of the participatory ideation sessions. The purpose of this is to understand how each participant already felt about working in a group, and their own experiences with being creative. The pre-session questionnaires were compared later to the post-session questionnaires, which asked similar questions. This allowed the designer to identify any changes of opinion or feeling that may have occurred as a result of the session. The questionnaires were also compared between the two different types of sessions, allowing the researcher to gain an understanding of how each session impacted each participant.



#### *Warm-up Diverge*

Before diving into the main section of the participatory ideation sessions, the researcher explained the purpose of the participatory ideation session. The warm-up diverge gave the participants a chance to practice diverging on an individual level so that they were practiced and able to contribute during the four main activities of the session.

Participants were asked to write the first five words that popped into their head onto a note card. For some participants, this was a challenge, and almost a minute and a half to write five words. I even prompted them by saying, "Any word, just off the top of your head!". It seemed like they were self-judging, a point that I warned against during the introduction. I think this exercise made them recognize that they were used to self judging, and therefore, they were able to consciously avoid it later in the session.

During each session, the researcher encouraged participants to produce as many ideas as possible through the use of prompts and methods. As stated previously, prompts were derived from the research of Wallach and Kogan and the methods chosen were methods suggested by facilitators interviewed during the previous stage. The designer carefully selected the methods based on what was experienced by herself, discovered during secondary research, and suggested to her by other design researchers. From this, the designer was able to create a detailed agenda for each facilitated session. Because facilitators often have time limits, and the goal of the comparative study was to show improvement within a certain time frame, each activity was given a set amount of time in which the activity must be completed.

There are 4 main generative design research methods deployed during the part of the participatory ideation sessions in which divergent production is highly encouraged. The designer facilitated the methods in order from methods requiring the least interaction and movement, to methods requiring the most group interaction and movement. This allowed the participants to ease into divergent production and was especially important for participants who lacked experience with group activities or divergent activities.

Below is the general agenda for all participatory ideation sessions facilitated during this project.

**Agenda:**

1. Introduction- 2 minutes
2. Pre-questionnaire- 10 minutes
3. Warm-up Diverge- 5 minutes
4. Circle Test (Wallace and Kogan)- 10 minutes
5. Alien Perspective- 10 minutes
6. Scribble, Say, Slap- 10 minutes
7. Brainstorming- 10 minutes
8. Post-questionnaire- 10 minutes
9. Questions and Answers- 5 minutes
10. Conclusion-- 5 minutes

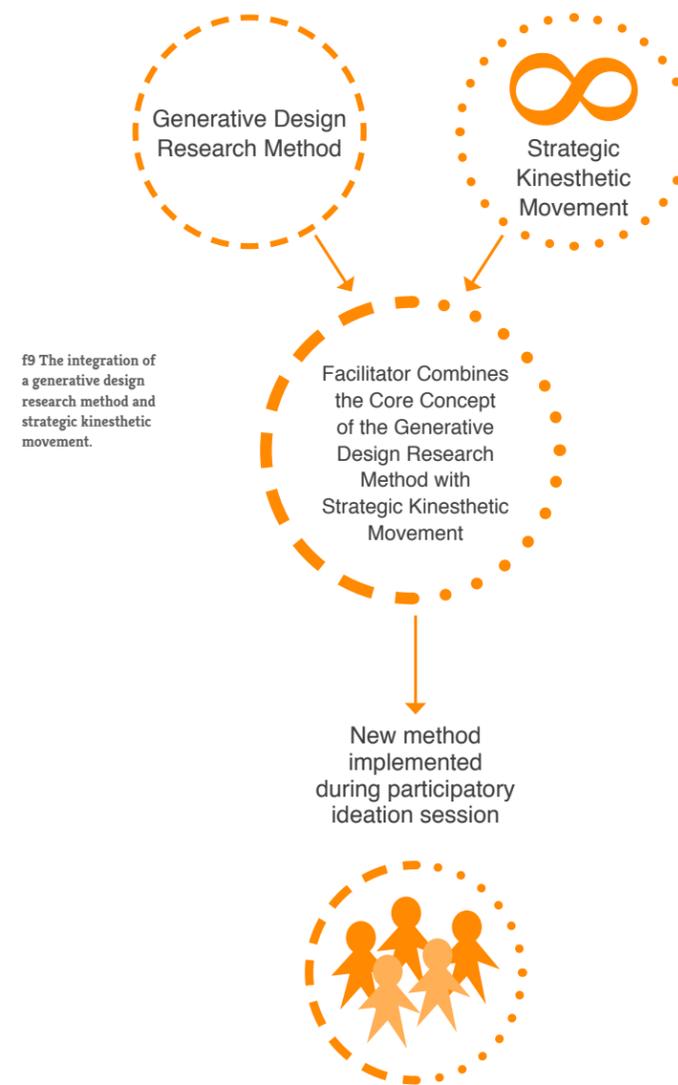
main focus of participatory ideation sessions

The methods used in the participatory ideation sessions *excluding* strategic kinesthetic movement are, in concept, the same as those used in the participatory ideation sessions *including* strategic kinesthetic movement. The difference lies in the movements required of the participants in order to complete the same task. The designer structured each session so that each sub-sequent method increased these factors from the previous method: participant interaction, complexity, intensity of physical activity, necessary space, and estimated time to explain activity.

**How might generative design research methods infused with strategic kinesthetic movement be integrated into the part of participatory ideation sessions in which divergent production is encouraged?**

Sub-Question 2

By keeping the core concept of each method used during the sessions without strategic kinesthetic movement in tact, the designer was able to manipulate each original generative design research method to include strategic kinesthetic movement. The methods infused with strategic kinesthetic movement were then implemented during the sessions meant to include the movements.<sup>19</sup>





### Circle Activity

During the sessions *excluding* strategic kinesthetic movement, participants are given a sheet with circles printed on a grid. The circles serve as a prompt. Participants are then given 10 minutes to change as many different circles into something else as possible.

This is part of the Wallach and Kogan test for creativity.<sup>59</sup> The purpose of this is to allow participants to diverge on their own, as well as to introduce them to the act of thinking of different uses for one thing, a concept which was repeated during each session.

Strategic kinesthetic movement was then inserted into the method for use during the participatory ideation sessions including strategic kinesthetic movement. Because this was the first of the main generative design research tools used, and the first encounter of strategic kinesthetic movement within the session, the researcher chose to integrate rhythmic movements with the circle test. Music was played and participants were asked to remain in constant motion to the beat of the music. This could have consisted of tapping their feet, bobbing their head, or swaying.

Compared to the other forms of strategic kinesthetic movement, rhythmic movements require the least amount of physical activity and therefore were a good starting point for participants.



Participant working on the Circle Activity

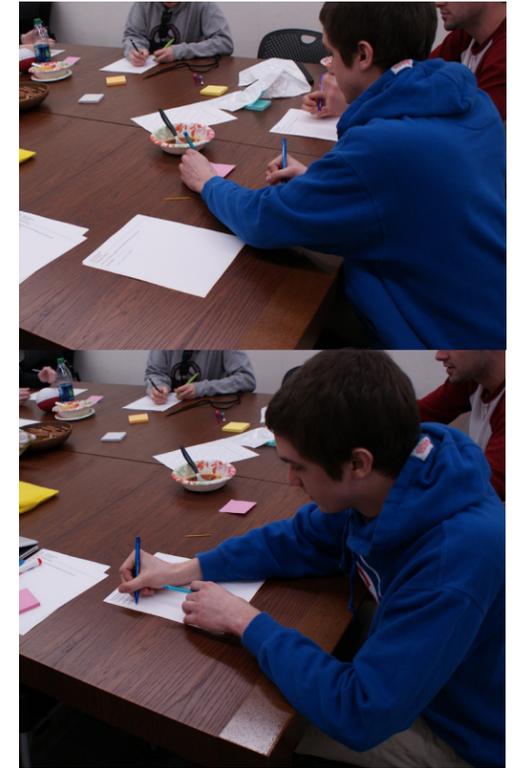


### Alien Perspective

Participants are each given an object and 5 pieces of paper. For two minutes at a time, participants are to write or draw as many uses that they can think of for that object. They are instructed to think as though they are aliens who have never seen their object before. Once 2 minutes is over, participants pass their object to the left and go to the next page to diverge on uses for the new object they've received. There are 5 rounds of 2 minute ideation periods, adding up to a total of 10 minutes for this exercise. Each participant has the same amount of time to ideate with each object.

During the participatory ideation sessions in which strategic kinesthetic movement is used, the designer introduced cross-lateral movements during the Alien Perspective method. The core of this exercise stayed the same. Objects were passed around and participants were asked to capture as many uses for the object in their possession as they could within a 2 minute time period.

Participants were each given two writing utensils and two pieces of paper. With their dominant hand, participants wrote their answers on the paper in front of their indominant hand. Immediately after an idea is captured with the dominant hand, the indominant hand reached to the paper in-front of the participants dominant hand and drew a vertical line on the paper. This created a continuous cross-lateral movement. The researcher also observed that many participants were creating their own rhythm and seemed to capture ideas to an internal tempo. In this way, the alien perspective method utilized two forms of strategic kinesthetic movement.



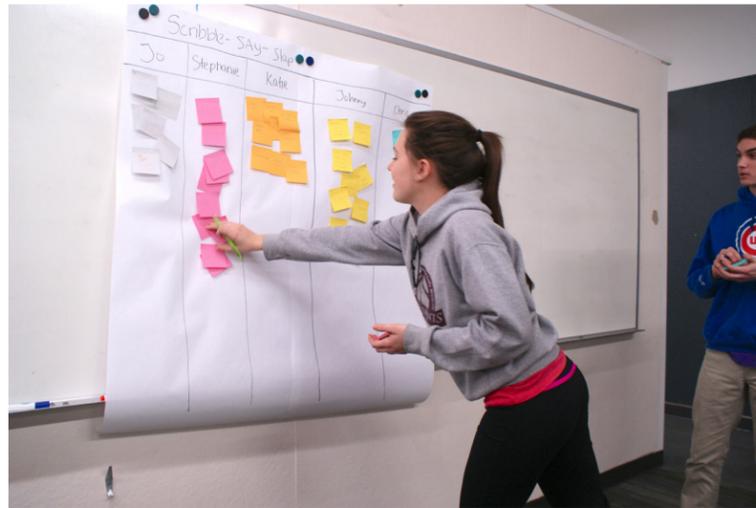
Participant working on the Alien Perspective Method Including Strategic Kinesthetic Movement.



### **Scribble, Say, Slap**

Participants were each given a different color of sticky note and a pen and asked to come up to the board. They are given the prompt, “Name as many uses for a *belt* as possible.” They write an answer on the post-it, say it out loud and then slap it to the board. This allows for participants to hear and understand the ideas that have been contributed. This was the first activity in which participants shared ideas with one another and therefore had the opportunity to inspire each other to produce more ideas. During participatory ideation sessions *excluding* strategic kinesthetic movement, all sticky notes were placed on a large sheet of paper in any random spot. This created a large cluster of sticky notes.

During participatory ideation sessions *including* strategic kinesthetic movement, the large piece of paper used during this method was sectioned off into five equal parts. Each part was labeled with one participant’s name. They are given the prompt, “Name as many uses for a *jar* as possible.” Participants were instructed to stand to the left or right of their name and reach across their body in order to place an idea onto the board. This served two purposes; not only did this clean up the board, but it also integrated cross-lateral movements.



Participants during the Scribble, Say, Slap method including Strategic Kinesthetic Movement.



### **Brainstorming**

During the participatory sessions *excluding* strategic kinesthetic movement, participants, while sitting, were each given a foam lightbulb and asked to raise the light bulb over their head when they had an idea that they wanted to contribute. They were then given the prompt, “Name things with wheels.” The facilitator captured each answer on a large piece of paper, being careful to label each idea with the initials of the participant who contributed it. The purpose of labeling is so data may be analyzed on an individual and group level. While this method incorporated movement, it was generic movement, not any type of strategic kinesthetic movement highlighted during this project, and was reflective of the type of movements commonly used by design researchers and facilitators.

During the participatory sessions *including* strategic kinesthetic movement, participants stood around a large board covered in paper. They were then given the prompt, “Name things that make noise.” The group was given one ball with juggling scarves tied around it. The participants took turns swinging the object in the shape of a figure eight and following the ball with their eyes. Participants developed their own sense of rhythm while swinging the scarf ball and many would swing to an internal tempo. Each time they complete the eight, they had to say an idea until they contribute three new ideas. When they fail to come up with an idea in time, they passed the ball to the next person. The facilitator captured all of the ideas as the individual provided them and marked each contribution with the contributor’s initials for later analysis. This method combined both types of strategic kinesthetic movement used in this project: cross-lateral movements and rhythmic movements.

This version of Brainstorming took the most time to explain and the most space to complete of all of the methods due to its complexity and intense physical activity.



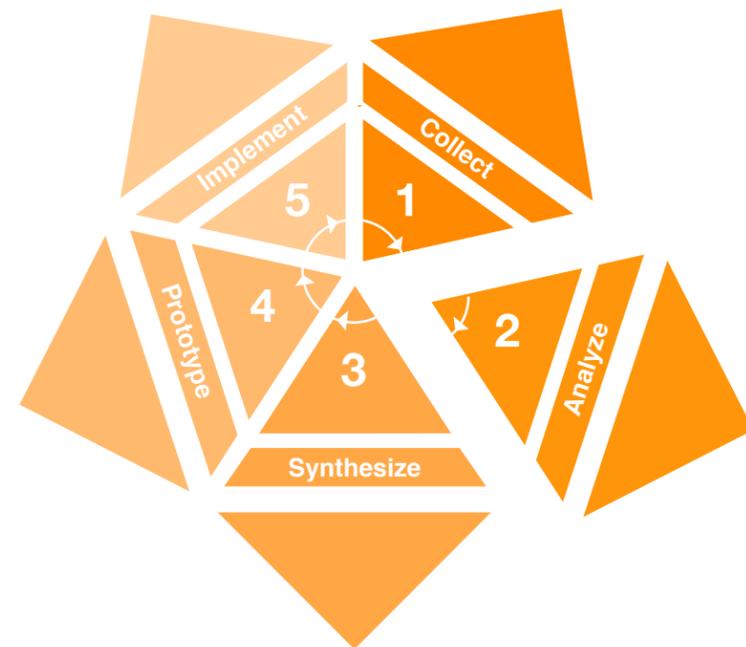
Participants during the Brainstorming method without Strategic Kinesthetic Movement.



Participants during the Brainstorming method including Strategic Kinesthetic Movement.

## Analyze

The second phase of this design research project is to **Analyze**. The main objective of this phase is to dissect the information obtained during the previous phase, Collect, in order to gain an in-depth understanding of the context. Breaking down all of the data into understandable and manageable pieces of useful information allowed the designer to identify meaningful patterns within the data. In order to determine whether or not strategic kinesthetic movement improved divergent production during the participatory ideation sessions, and what elements of the facilitated sessions changed with the introduction of strategic kinesthetic movement, the designer had to evaluate the outcomes of the generative design research methods.



Sub-  
Question  
3

***How might generative design research methods infused with selected kinesthetic movements be evaluated in terms of how well they encourage divergent production in participants during participatory ideation sessions?***

In order for the design researcher to understand how strategic kinesthetic movement might be utilized during participatory ideation sessions in the future, she first had to identify the challenges that she faced while facilitating the sessions.

While all participatory ideation sessions had the same agenda, only two sessions included strategic kinesthetic movement. Identifying the key differences experienced between the sessions including strategic kinesthetic movement and sessions excluding strategic kinesthetic movement was instrumental in identifying the effects of strategic kinesthetic movement.

The facilitator was responsible for motivating the participants to contribute ideas. The one thing that threatens divergent production above all else is **judgment**. Participants who fear that their idea will be judged tend to withhold their ideas. Therefore, the facilitator made sure to speak to the importance of suspending judgment before each session. According to Sam Kaner, an expert on facilitation:

By teaching suspended judgment and by modeling it whenever possible, a respectful, supportive facilitator can create a relaxed, open atmosphere that gives people permission to speak freely – the very essence of divergent thinking.<sup>60</sup>

The researcher looked for instances of judgment within the data collected from the participatory ideation sessions. Because judgment is the main inhibitor of divergent thinking, it is also a main inhibitor of divergent production. Therefore, the researcher concluded that by understanding how strategic kinesthetic movement affected participant's willingness to suspend judgment, she would understand how it affected their willingness to contribute ideas.

Along with **judgment**, the researcher also looked for moments of **bonding** between the participants. Because many participants hadn't met before their first participatory ideation session, each participant's comfort level varied. Some were comfortable working in groups with strangers while others were quiet until they got to know their group members. The researcher looked for specific moments of bonding in order to discover whether or not strategic kinesthetic movement affected the participant's comfort and ability to build relationships during the participatory ideation sessions.

The researcher also looked for any interesting actions or behavior changes. This included watching how they handled each method and how they responded to each session in general.

Identifying moments of judgment, bonding, and interesting actions or behavior changes yielded qualitative data.

In order to yield quantitative data and supportive evidence that strategic kinesthetic movement improved divergent production, the researcher reviewed the results of the generative design research methods used in the participatory ideation sessions. As explained earlier, divergent production presents itself in the form of ideas. In order to understand how productive participants were, ideas generated from each method were counted and given a final **fluency** score. Fluency refers to the number of ideas generated. Each participant received fluency scores for each method in which they participated. The researcher then compared scores from the participatory ideation sessions *excluding* strategic kinesthetic movement, to fluency scores achieved during participatory ideation sessions *including* strategic kinesthetic movement.

Understanding which sessions were more successful gave the researcher grounds for understanding why certain judgments and moments of bonding occurred and whether or not they encouraged or impeded divergent production.

Sources:



## Unpacking

Prior to in-depth analysis, all information collected during the previous stage including: notes from interviews, worksheets, photos, videos, questionnaires and notes from observations of the groups during their sessions were all considered *raw data*, meaning that it had yet to be made into meaningful insights. The researcher began analysis with a method called, “Unpacking”, that comes from by the designer, Jon Kolko, in his book *Exposing the Magic of Design*.<sup>61</sup> In order to *unpack* the data, the designer looked at each piece of information and asked herself three questions, “What do I see?”, “What does it mean?”, and “Why does it matter?”

By asking, “What do I see?”, the researcher to described the data collected from the previous phase. Descriptions of the data are still just raw data because they are concrete findings that have not yet been thought about in a meaningful way by the researcher. Each source of data may yield multiple pieces of raw data.

The next prompt, “what does it mean?”, encouraged the designer to expand upon the data by assigning meaning to each piece of raw data. Assigning meaning to each piece of data gave the researcher more information about the context and enabled the designer to use her intuition and experiences to make sense of the data.

The final prompt, “Why does it matter?”, prompted the designer to think about why each piece of data was relevant to the research question. Pairing each piece of data with insights from the previous prompt, gave the designer an opportunity to identify emerging insights and values. Understanding the value of each piece of data enabled the designer to shape meaningful insights.

The researcher recorded each piece of information onto sticky notes so that the data became mobile and was able to be rearranged during the following pattern-finding method.

Re-organizing the data gave the researcher the opportunity to make sense of what’s going on in a changing and complex environment through visual means. The designer externalized patterns and connections observed amongst the data by moving similar pieces of data closer to each other. The researcher drew connections and identified patterns which led to key findings.



Unpacking the data.- “What do i see?”



Pattern-finding amongst the data.

The researcher found several connections within her data, which led to the key findings described below.

In contrast to sessions without strategic kinesthetic movement, **participants were much more talkative with each other during the sessions including strategic kinesthetic movement.** The fact that participants felt comfortable enough to speak to one another openly, implies that the participants had bonded. According to their questionnaires, Participants felt as though they were being judged in the beginning of the sessions including strategic kinesthetic movement but quickly realized that everyone was feeling awkward due to the movements, which eliminated the feeling of judgment. Participants felt the movement allowed them to forget about being judged because everyone looked silly. **The movements provided a situation in which there was a level of mutual awkwardness. The participants bonded over the mutual awkwardness and began being more open with one another.**

There were instances of judgment in both types of participatory ideation sessions. **While judgments made during the participatory ideation sessions excluding strategic kinesthetic movement seemed to stifle divergent production, judgments made during sessions including strategic kinesthetic movement were often delivered in the form of a joke due to their ability to bond, and actually encouraged divergent production.** The more comfortable the participants became the more they joked with each other and then would build off of each other’s jokes, generating more ideas. For example, when asked to name things that make noise, one participant named another participant. Because the participants had bonded over the mutual “silliness” of their actions, instead of this being taken as a personal attack or judgment, the **humor prompted other participants to think of people who make noise such as students, children, music teacher, etc.**

Participants commented during the session that they felt they didn’t have enough space during some of the methods including strategic kinesthetic movement. Specifically, some participants felt they didn’t have enough room during Alien Perspective and Brainstorming. Both of these methods relied on cross-lateral move-

ments as their main strategic kinesthetic movement. The researcher noted that **cross-lateral movements generally require more space** than the rhythmic movements being used in this research project.

Along with space, **time** became an issue when explaining each method. The facilitator must complete the session during the amount of time allotted for the session. The facilitator demonstrated each method before officially beginning each method by starting the timer. The methods including strategic kinesthetic movements were difficult to explain and demonstrate because the participants were being introduced to new ways of moving and thinking. **Demonstrations and explanations took longer for methods including the movements than they did for methods without the strategic kinesthetic movements.**

While some participants stated that they usually prefer to work alone, but that they didn't feel the collaborative sessions were too taxing. When asked why, participants stated that **the gradual immersion into collaboration allowed them to practice their skills on an individual level before sharing. This gave them more confidence in their creative skills and therefore allowed them to be more open with the group once it was time for collaboration.**

During the Brainstorming method and the Alien Perspective method including strategic kinesthetic movement, **participants developed their own sense of rhythm. Because they developed an internal tempo during the generative sessions, they managed to create their own deadlines for producing ideas.** For example, during the Brainstorming method including strategic kinesthetic movement, participants were asked to swing the scarf ball in the form of a figure eight and to contribute one idea every time one figure eight was completed. Participants developed an internal tempo which informed their movements and allowed the scarf ball to swing in a rhythm. The pace that participants set for themselves dictated the rate at which that they needed to contribute an idea. **Each participants internal rhythm acted as a countdown to their next idea which motivated them to contribute.**

While the participatory ideation sessions provided the viewpoint of the participants, interviews provided the view-point of a facilitator. Facilitators were concerned that introducing strategic kinesthetic movement might complicate their participatory ideation sessions. The researcher interpreted that this meant that most **facilitators did not know how to include strategic kinesthetic movement in a way that would benefit their session.**

Facilitators also expressed a concern that participants with inhibiting physical limitations may not be able to take part in the strategic kinesthetic movement, and therefore, the session. **The facilitator may choose the types of strategic kinesthetic movement based upon the physical limitations of the participants.**

Another concern facilitators who were interviewed mentioned was the uncertainty of space. Facilitators were uncertain that they would always have enough space during their sessions to include both types of strategic kinesthetic movement. **The type of strategic kinesthetic movement needed would be chosen by the facilitator based on how much space they have for their session.**

**Facilitators were also concerned that methods including the strategic kinesthetic movements might take longer than their usual methods.** Every session has a time limit and it is the facilitators job to make each session as efficient as possible within the set time limit. The researcher interpreted that the facilitators were concerned that the methods including strategic kinesthetic movement were too complex and the complexity would cause them to take more time to complete. **The complexity of the method relies on how the facilitator infuses the method of choice with the strategic kinesthetic movement, or movements, of choice. Facilitators decide which type of strategic kinesthetic movement to include, how many types to include, and how much they want the method to rely on the movements.**

**Facilitators must preserve the core concept of the original method when combining a method with strategic kinesthetic movement.** Altering the core concept of the method, alters the entire method and therefore, becomes more complex and difficult to explain and demonstrate to participants. **Strategic kinesthetic movements should be molded to the method and the method molded to the strategic kinesthetic movements. They should work together and function as one cohesive method.** Splitting the method from the movement, for example, asking participants to do some cross-lateral movements prior to the generative design research method will cause a disconnect between the movements and the goal that the facilitator and participants are trying to achieve. **In the context of a participatory ideation session, separating movement from method deprives the strategic kinesthetic movement of purpose and cause the movement to be viewed by participants as a separate activity rather than a purposeful means to reaching their goal.**

Sources:



## Quantitative Analysis

In order to yield quantitative data and supportive evidence that strategic kinesthetic movement improved divergent production, the researcher reviewed the results of the generative design research methods used in the participatory ideation sessions. As explained earlier, divergent production presents itself in the form of ideas. In order to understand how productive participants were, ideas generated from each method were counted and given a final **fluency** score. Fluency refers to the number of ideas generated. Each participant received fluency scores for each method in which they participated. The researcher then compared scores from the participatory ideation sessions *excluding* strategic kinesthetic movement, to fluency scores achieved during participatory ideation sessions *including* strategic kinesthetic movement. *Due to an unforeseen absence, the number of total participants dropped from 20 to 19.<sup>10</sup>*

The following numbers refer to the total number of ideas contributed by the group during each session. Group 1A and Group 1B finished the participatory ideation session *excluding* strategic kinesthetic movement before completing the participatory ideation session *including* strategic kinesthetic movement. Group 2A and Group 2B finished the participatory ideation session *including* strategic kinesthetic movement before completing the participatory ideation session *excluding* strategic kinesthetic movement.

### Group 1A

session *with* strategic kinesthetic movement: 617   
 session *without* strategic kinesthetic movement: 403

### Group 1B

session *with* strategic kinesthetic movement: 728   
 session *without* strategic kinesthetic movement: 392

### Group 2A

session *with* strategic kinesthetic movement: 415   
 session *without* strategic kinesthetic movement: 388

### Group 2B

session *with* strategic kinesthetic movement: 400   
 session *without* strategic kinesthetic movement: 346

All four groups **improved** their fluency score and, therefore, divergent production during the participatory ideation sessions including strategic kinesthetic movement.

Participatory Ideation Session Research Plan

		Round 1	Round 2
20 Participants- 5 per group	Group 1A 	Participatory Ideation Session <i>Without</i> Strategic Kinesthetic Movement	Participatory Ideation Session <i>With</i> Strategic Kinesthetic Movement
	Group 1B 	Participatory Ideation Session <i>Without</i> Strategic Kinesthetic Movement	Participatory Ideation Session <i>With</i> Strategic Kinesthetic Movement
	Group 2A 	Participatory Ideation Session <i>With</i> Strategic Kinesthetic Movement	Participatory Ideation Session <i>Without</i> Strategic Kinesthetic Movement
	Group 2B 	Participatory Ideation Session <i>With</i> Strategic Kinesthetic Movement	Participatory Ideation Session <i>Without</i> Strategic Kinesthetic Movement

f10 Participatory Ideation Session Research Plan

Facilitators are responsible for running the participatory ideation session as efficiently as possible. In order to determine efficiency of these sessions, the researcher calculated the rate of divergent thinking by dividing the fluency score by the time taken to produce that number of ideas. In this case, the total amount of time for ideation was 40 minutes. Each session ended up with a score of ideas per minute of ideation.

## Rate of Divergent Production

### Group 1A

session *with* strategic kinesthetic movement: 15.43/min  
 session *without* strategic kinesthetic movement: 10.08/min

### Group 1B

session *with* strategic kinesthetic movement: 18.2/min  
 session *without* strategic kinesthetic movement: 9.8/min

### Group 2A

session *with* strategic kinesthetic movement: 10.38/min  
 session *without* strategic kinesthetic movement: 9.7/min

### Group 2B

session *with* strategic kinesthetic movement: 10/min  
 session *without* strategic kinesthetic movement: 8.65/min

Not only was divergent production improved through the use of strategic kinesthetic movement, but the methods including strategic kinesthetic movement were actually more efficient than the methods without strategic kinesthetic movement.

## Summary of Key Findings

1. The movements provided a situation in which there was a level of mutual discomfort. The participants bonded over the mutual awkwardness and began being more open with one another.

2. While judgments made during the participatory ideation sessions excluding strategic kinesthetic movement seemed to stifle divergent production, judgments made during sessions including strategic kinesthetic movement were often delivered in the form of a joke due to their ability to bond, and actually encouraged divergent production

3. The gradual immersion into collaboration allowed them to practice their skills on an individual level before sharing. This gave them more confidence in their creative skills and therefore allowed them to be more open with the group once it was time for collaboration.

4. Cross-lateral movements generally require more space than the rhythmic movements being used in this research project.

5. Demonstrations and explanations took longer for methods including the movements than they did for methods without the strategic kinesthetic movements.

6. Participants developed their own sense of rhythm. Because they developed an internal tempo during the generative sessions, they managed to create their own deadlines for producing ideas. Each participant's internal rhythm acted as a countdown to their next idea which motivated them to contribute.

7. Facilitators did not know how to include strategic kinesthetic movement in a way that would benefit their session.

8. The facilitator may choose the types of strategic kinesthetic movement based upon the physical limitations of the participants.

9. The type of strategic kinesthetic movement needed would be chosen by the facilitator based on how much space they have for their session.

10. Facilitators were also concerned that methods including the strategic kinesthetic movements might take longer than their usual methods.

11. The complexity of the method relies on how the facilitator infuses the method of choice with the strategic kinesthetic movement, or movements, of choice.

Facilitators decide which type of strategic kinesthetic movement to include, how many types to include, and how much they want the method to rely on the movements.

12. Facilitators must preserve the core concept of the original method when combining a method with strategic kinesthetic movement.

13. Strategic kinesthetic movements should be molded to the method and the method molded to the strategic kinesthetic movements. They should work together and function as one cohesive method.

14. In the context of a participatory ideation session, separating movement from method deprives the strategic kinesthetic movement of purpose and cause the movement to be viewed by participants as a separate activity rather than a purposeful means to reaching their goal.

15. All four groups improved their fluency score and, therefore, divergent production during the participatory ideation sessions including strategic kinesthetic movement.

16. Not only was divergent production improved through the use of strategic kinesthetic movement, but the methods including strategic kinesthetic movement were actually more efficient than the methods without strategic kinesthetic movement.



### Pattern Finding

Findings were each written on a sticky note and the researcher identified connections between some of the findings by re-arranging the sticky notes. Through pattern finding, the researcher realized that all of her original findings could be split into two categories: Facilitator Challenges and Benefits of Strategic Kinesthetic Movement. From these categories, she developed key insights to be carried over into the next phase of the design process, Synthesize.

### Key Insights

Facilitators, whether they are designers or non-designers, can benefit from including strategic kinesthetic movements into their participatory ideation sessions. However, the researcher identified challenges that emerged during the sessions including strategic kinesthetic movement. Therefore, any facilitator who plans on implementing strategic kinesthetic movements must account for and adapt to these challenges in order to reap the benefits. There were 4 main facilitator challenges identified by the researcher during analysis.

#### 1. Physical Abilities of Participants

The strategic kinesthetic movements implemented in this research project were ranked from least physically demanding to most physically demanding. The rhythmic movements used in this project were less physically demanding than the cross-lateral movements. Therefore, the facilitator had to be conscious of the physical capabilities of the participants.



Physical Limitations



No Physical Limitations



Small Group



Large Group



Small Amount of Personal Space



Large Amount of Personal Space



Small Amount Time to Explain



Lengthy Explanation

#### 2. Group Size

Whenever a facilitator is planning a session, they must know how many people will be in attendance. The more participants in a group, the more challenging the facilitator's job of keeping the group focused becomes.

#### 3. Space

As the intensity of physical activity increased and the movements got more complex, the participants needed more space in order to accomplish the movements. Rhythmic movements took less space than cross-lateral movements.

#### 4. Time

As the complexity of the methods increased along with the intensity of physical activity, the amount of time taken to explain and demonstrate each method increased.

After pattern-finding, the researcher identified 4 main benefits of using strategic kinesthetic movement during participatory ideation sessions.

#### 1. Building Relationships

Participants were much more open and talkative with each other during the sessions including strategic kinesthetic movement. The movements provided a situation in which there was a level of mutual discomfort. The participants bonded over the mutual awkwardness and began being more open with one another. While judgments made during the participatory ideation sessions excluding strategic kinesthetic movement seemed to stifle divergent production, judgments made during sessions including strategic kinesthetic movement were often delivered in the form of a joke due to their ability to bond, and actually encouraged divergent production.

#### 2. Motivation

Participants developed their own sense of rhythm. Because they developed an internal tempo during the generative sessions, they managed to create their own deadlines for producing ideas. Each participants internal rhythm acted as a countdown to their next idea which motivated them to contribute.

#### 3. Improved Fluency

All four groups improved their fluency score and, therefore, divergent production during the participatory ideation sessions including strategic kinesthetic movement.

#### 4. Improved Efficiency

Not only was divergent production improved through the use of strategic kinesthetic movement, but the methods including strategic kinesthetic movement were actually more efficient than the methods without strategic kinesthetic movement.

Key insights were carried over to the next phase, Synthesize.

## Synthesize

The third phase of the CASPI process is **Synthesize**. The main objective of the Synthesis phase is to use what was learned during the previous phase, Analyze, in order to identify opportunities and generate ideas for possible solutions. While the Analyze phase is focused on “what is”, the Synthesize phase is focused on “What could be?”<sup>62</sup> Ideas selected during this phase were then moved into the Prototyping phase.

When conducting participatory design research, involving the stakeholders is very important because they have a different point of view from the design researcher and are each able to contribute new insights and ideas. Participants and facilitators from the Collect phase were asked to be involved during the ideation process. While some methods were meant to involve stakeholders, others were meant to serve as a vehicle to further the researcher’s understanding and only included the design researcher.

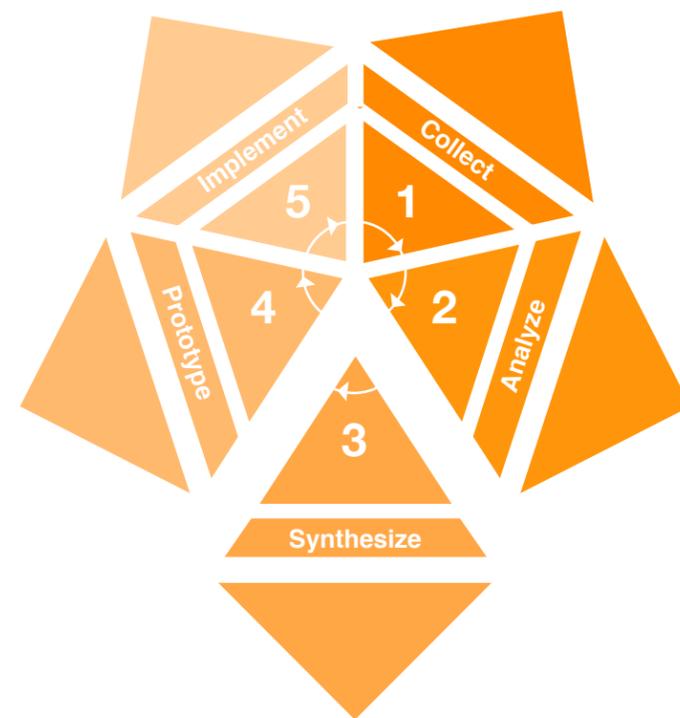
Because the intention of this project is to show how divergent production during participatory ideation sessions may be improved utilizing strategic kinesthetic movement, the facilitator became a key stakeholder during the synthesis phase. Unless the facilitators, whether they are designers or non-designers, understand how to properly integrate strategic kinesthetic movement into their own generative methods and participatory ideation sessions, the information may get misused or lost, causing the strategic kinesthetic movement to possibly have little or no effect on divergent production.

Enabling facilitators to utilize this information for their own benefit ensures that the strategic kinesthetic movement will be functioning as intended within participatory ideation sessions. Designing with the facilitators themselves allowed them to mold the solution to fit their needs. From this intention, the researcher developed a challenge statement.

***How might designers and non-designers come to understand how to integrate the movements into their own methods and participatory ideation sessions?***

A challenge statement serves as a prompt during synthesis. By asking, “How might”, the statement prompts the designer and stakeholders to think about possible solutions, or, “What could be?”

Before engaging the stakeholders in ideation, the researcher engaged in solitary methods in order to reflect, interpret, and internalize. The purpose of this was to further define the opportunity space in order for the stakeholders to better understand the current situation within the context.



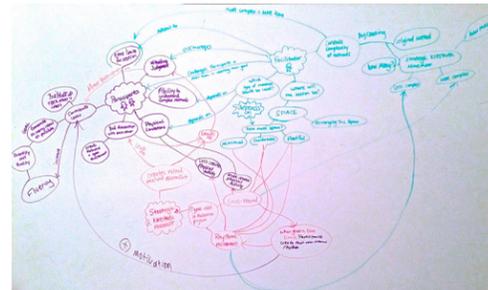


## Visual Sensemaking

Visual Sensemaking is a process that describes the patterns the designer sees, the constraints the designer applies, and the mental models the designer forms about a specific design problem.<sup>63</sup> Visual sensemaking encourages designers to externalize patterns and connections observed amongst the data and makes it easier for the designer to find areas of opportunity. Visual sensemaking during Synthesis, the researcher utilized the key insights from Analysis to construct a visual map of the situation within their context in order to further define the challenge. This method also gave the designer a change to internalize and reflect upon the findings. The researcher drew connections and identified patterns which led to new insights and opportunities.

The researcher discovered that all of the challenges facilitators faced in terms of developing the methods including strategic kinesthetic movement were connected to a choice between the two types of strategic kinesthetic movement. For example, the facilitator must take into account the physical abilities of the participants, whether they have any limitations that would exclude them from physical activity or not. The types of movement utilized in this research project were rhythmic movements and cross-lateral movements. According to participants, the rhythmic movements were less physically intense than the cross-lateral movements. **Therefore, the facilitator may choose a type of strategic kinesthetic movement based on how active their participants may be. This means that each type of strategic kinesthetic movement may be ranked from least physically demanding to most physically demanding.**

Discovering this led the designer to rank the types of strategic kinesthetic movement in terms of time, space, number of participants, and physical abilities of participants.



The result of Visual Sensemaking was a messy knot of meaningful relationships and insights.



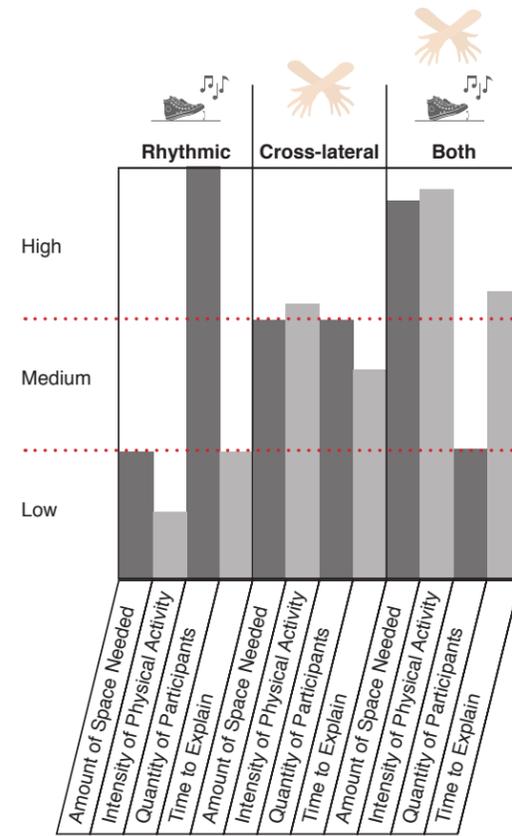
## Combining Key Insights

Because one of the opportunities discovered during visual sensemaking was that the types of strategic kinesthetic movements used in this research project could be ranked in terms of the amount of space generally needed for that type of movement, the intensity of physical activity that each type of movement requires, and size of the group or number of participants that each movement works better with, and the time it takes to explain or demonstrate each movement, the researcher created the rankings for each movement in order to combine two key insights. Combining the insights allowed the researcher to further define the problem so that participants would be able to understand the context and contribute to the ideation process.

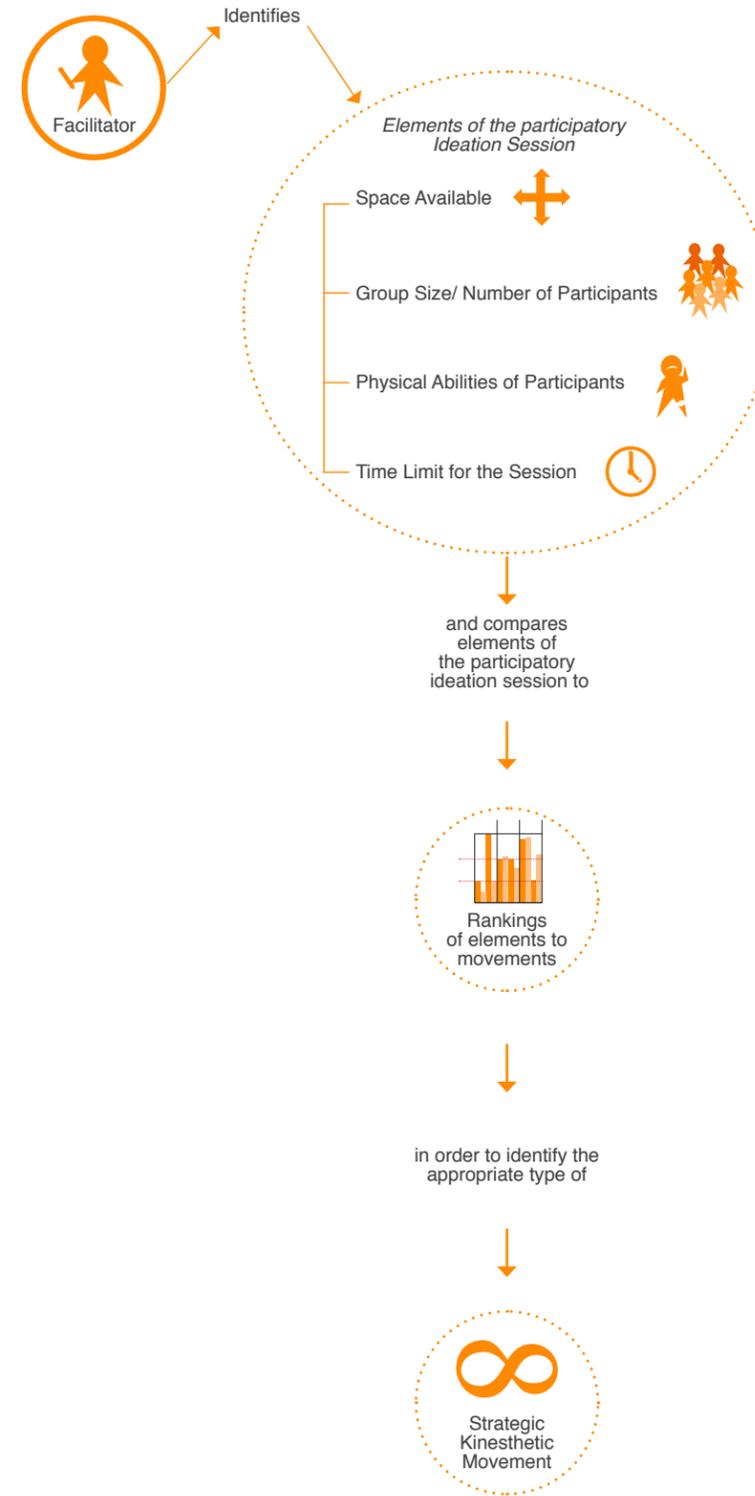
After visualizing each ranking, the researcher paired it with the insight that Facilitators must know all of the elements contributing to their sessions before attempting to develop their methods including strategic kinesthetic movement. The Facilitator must know how much space they will have for the session and how much personal space each participant will have. The facilitator needs to know if they are working with a small, medium, or large group of people because some types of movement are harder to coordinate with more people involved.

Along with knowing how many people will be participating, it is the facilitator's responsibility to find out if any of the participants has any physical limitations that might prevent them from engaging in strategic kinesthetic movement during the session. Finally, the facilitator needs to know how much time they have for the session and be able to budget the time to accommodate time to explain for each type of strategic kinesthetic movement. The types of movement may be ranked by these same elements.

Because the facilitator must choose which type of strategic kinesthetic movement to use, and the appropriate choice depends on the four elements of the facilitated session connected to strategic kinesthetic movement, and each type of movement is able to be ranked in terms of each element,<sup>f11</sup> the facilitator may use what they know about their participants and facilitated session to make decisions about strategic kinesthetic movement.<sup>f12</sup>



f11 Types of Strategic Kinesthetic Movement were ranked against the challenges they create.



f12 The Facilitator knows and understands the elements of their session and compare them to the challenges of the strategic kinesthetic movement in order to identify which type of movement is appropriate for their session.



## Concept Map

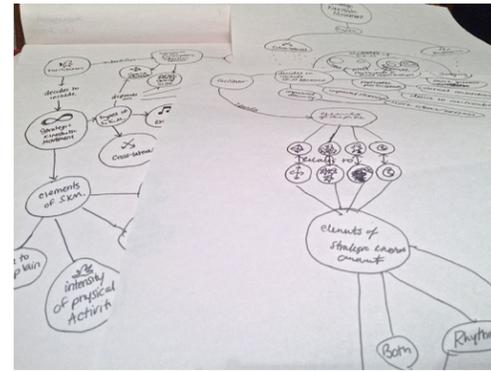
A concept map is a diagram of the relationships between entities in a system.<sup>64</sup> It is a graphical method for organizing and representing knowledge.<sup>65</sup> The researcher constructed multiple concept maps from key insights identified during analysis and problem definition. In the design process, iteration helps the designer explore multiple forms that the relationships might take. The goal for this method was to create a concept map that communicated the current situation within the context to the stakeholders, as well as to solidify and externalize the designer's understanding of the relationships within the context.<sup>13</sup>

The designer initially created separate concept maps for strategic kinesthetic movement in participatory ideation sessions and the facilitator's role in planning the participatory ideation session including strategic kinesthetic movement. By developing a map of understanding for each element separately, the designer was able to combine the two into one cohesive concept map. Creating multiple iterations of the holistic concept map allowed the researcher to explore multiple ways to visualize the concept.

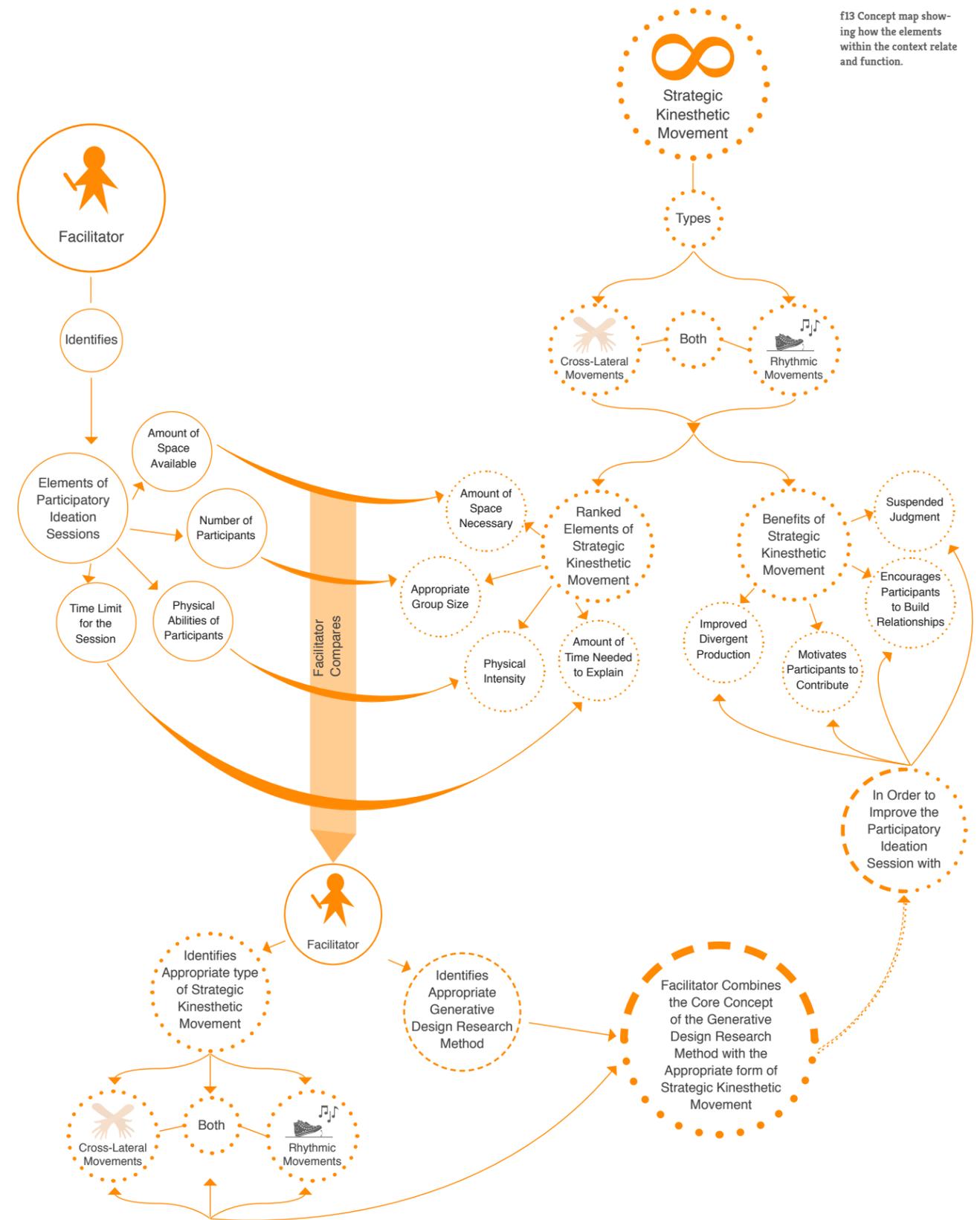
The final concept map reflects the purpose of strategic kinesthetic movement and the connection between the elements of participatory ideation sessions and the elements of strategic kinesthetic movement within a participatory ideation session.

Once the concept was formed, the researcher was ready to share her concept with stakeholders. Unlike methods meant specifically to aid the researcher's understanding, the goal of the methods conducted with the stakeholders was to generate ideas for possible solutions to the challenge statement:

**How might designers and non-designers come to understand how to integrate the movements into their own methods and participatory ideation sessions?**



Multiple iterations of the concept map were sketched out before creating a "cleaned up" version.



f13 Concept map showing how the elements within the context relate and function.



### **Opportunity Mind Map**

The Opportunity Mind Map provided a platform for stakeholders to define the core topics, gain understanding of the key aspects and then explore opportunities around those same core topics and aspects.<sup>66</sup>

The participants of this method were facilitators and a participant from the ideation sessions completed during the Collect phase. The researcher carefully walked the stakeholders through the concept map, identifying and defining all core topics and aspects in an effort to communicate the insights and relationships to the stakeholders.

Once the participants had an understanding of the context, the researcher introduced a piece of paper with the challenge statement written in the middle. Participants were asked to create a mind map of core concepts and opportunities. Once core topics were captured on the map, participants drew connections between aspects and generated ideas for a possible solution.

The goal for this method was to generate ideas for possible forms that the insights might take in order to enable facilitators to learn how to utilize strategic kinesthetic movement in their participatory ideation sessions, and how to infuse their generative design research methods with the strategic kinesthetic movement. Once the participants were done, the researcher scribed ideas onto sticky notes in order to analyze the map for areas of further exploration.



Participants wrote opportunities stemming from key elements within the context.



### **Designer Diverge**

In addition to ideating with stakeholders, the researcher led herself through a diverge in an effort to externalize any ideas that were not shared during the opportunity mind map. The designer simply wrote or drew every idea for a possible solution that came to mind. The researcher was able to pull from her experience and knowledge of the context in order to generate ideas.



### **Criteria Grid**

Once ideas for possible solutions had been generated, the researcher needed to evaluate and eliminate ideas based on a set of criteria defined by the researcher. A criteria grid allowed the researcher to compare and contrast all of the ideas against the criteria for this project. The criteria used were:

1. Designers and non-designers need to be able to use it
2. Must be accessible
3. Aids the facilitator in understanding how to utilize strategic kinesthetic movement during their participatory ideation sessions
4. Guides the facilitator in developing their own generative methods with strategic kinesthetic movement.

Using the criteria, the researcher converged to three ideas. These ideas were carried into the Prototype phase.

#### **1. Educational Booklet**

The strategic kinesthetic movements implemented in this research project were ranked from least physically demanding to most physically demanding. The rhythmic movements used in this project were less physically demanding than the cross-lateral movements. Therefore, the facilitator had to be conscious of the physical capabilities of the participants.

#### **2. Application (App)**

The more elements needed in order for the method to be deployed, the more complex it became. The complexity of the method affected the amount of time needed to explain and demonstrate the method. Therefore, the simpler the method, the less time spent explaining it.

#### **3. Framework/Matrix**

As the intensity of physical activity increased and the movements got more complex, the participants needed more space in order to accomplish the movements. Rhythmic movements took less space than cross-lateral movements.

## Prototype

The fourth phase of this design research project was **Prototype**. The main objective of the Prototype phase is to bring ideas generated during the previous phase, Synthesis, into a more tangible reality so that the ideas may be evaluated and improved upon before implementation. Prototyping is the use of simplified and incomplete models of a design to explore ideas, elaborate requirements, refine specifications, and test functionality.<sup>67</sup> The main question the designer asked herself during this phase was, “How could it be better?”

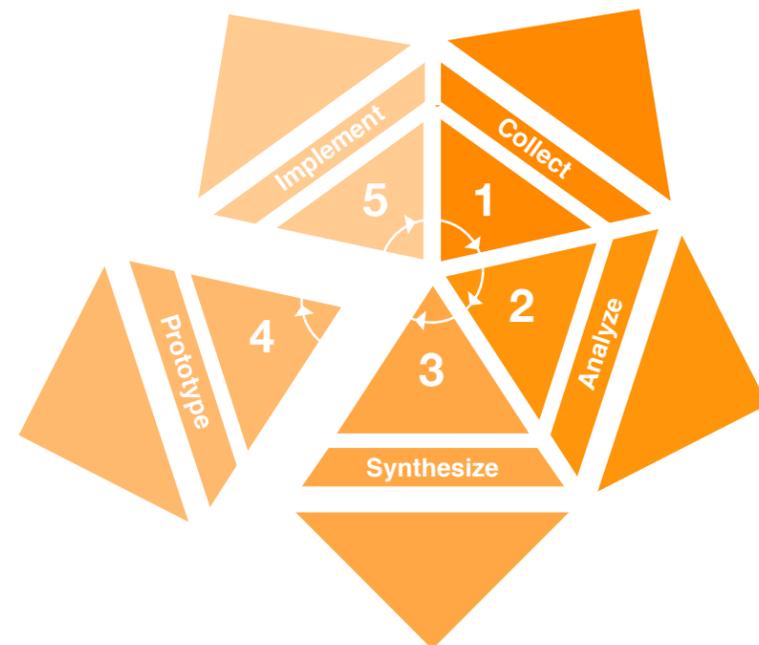
The purpose of prototyping is to evaluate and refine the prototypes in a series of quick iterations<sup>68</sup> Tom Kelley, head of IDEO encourages multiple prototypes in his book, “The Ten Faces of Innovation.” Kelley wrote, “The trouble with a lone prototype is that if you show someone your one-and-only bright proposal and ask expectantly, ‘What do you think?’, their answer is muddled by what they think about you.”<sup>69</sup> Multiple prototypes allowed the designer to gather honest feedback from stakeholders because, since there was more than one prototype to evaluate, stakeholders did not feel pressured to like one specific idea.

During this phase, the researcher developed prototypes based on her own experiences and knowledge of the context and engaged in participatory prototyping methods in order to evaluate and refine the prototypes. The ultimate goal of this phase was to create a concrete prototype that would become the final outcome of this research project.

After ideating with stakeholders, the researcher chose 3 separate ideas for prototyping. The goal of each prototype was to teach facilitators how to integrate strategic kinesthetic movements into their sessions and to help them decide which type of strategic kinesthetic movement would work best within their context. The three selected ideas were:

1. Educational Booklet
2. Application (App)
3. Framework or matrix

Throughout the prototyping process, these three ideas were narrowed down to one final outcome.





## Paper Prototyping

A paper prototype gives the designer an idea of what form an idea might take. Creating paper prototypes helped the researcher discover basic sizes and shapes of the ideas. During this method, the designer also began identifying elements within each prototype. The method was done with facilitators in order to gather feedback on each prototype.

The educational book included the research behind the strategic kinesthetic movement, the methods used by the researcher as examples, and then instructions on how the facilitator might create and use their own generative design research methods including strategic kinesthetic movement within the context of a participatory ideation session. Facilitators said that they don't need as much of the research because the concept is fairly simple and does not require a short research paper to understand. They felt that it distracted them from their task of developing the method including strategic kinesthetic movement and that even the types of movements were pretty much self explanatory.

The application included links to pages with information about the different types of movements and why you would want to use strategic kinesthetic movement. It also included pictures of people performing the different types of strategic kinesthetic movement. The application featured sliders which could be adjusted by the facilitator to identify the value of each of the four elements of participatory ideation sessions which affect strategic kinesthetic movement. Once all values were input by the facilitator, the application made suggestions about which type of movement was most appropriate for the facilitator's context. Facilitators brought up the point of transferability. An app may only be viewed on a smart phone or tablet, facilitators who do not have those devices would not have access to the solution. One of the participants in this method, a facilitator, actually didn't have those devices and felt left out of the solution.

The framework or matrix was simpler than the other two ideas. It led facilitators through a system of values in order to manually determine which type of strategic kinesthetic movement would be best. The framework did not provide in-depth explanation of the movements or the research behind the movements because facilitators did not need to be educated while operating the matrix. Furthermore, like the app, facilitators did not need to know why the matrix works, just that it works.



Stakeholders manipulated paper in order to prototype their ideas.

**The researcher and stakeholders discovered that all of the prototypes relied on some form of framework in order to actually aid the facilitator in creating their own methods including strategic kinesthetic movement. Therefore, the framework became the main prototype.**



## If/Then Visualization

Because paper prototyping led to the realization that all proposed solutions relied upon some sort of framework or matrix in order to aid the facilitator in designing their own method infused with strategic kinesthetic movement, the framework, or matrix, was selected to be the main concept continuing to be refined during prototyping.

An if/then visualization gave the researcher the opportunity to construct possible systems upon which the framework would operate. By visualizing cause and effect, the researcher gained understanding of what facilitators would need to input in order to be recommended a certain type of strategic kinesthetic movement. Understanding which variables constitute the recommendation of the use of cross-lateral movements, versus the use of rhythmic movements, gave the researcher a better idea of how the framework could function. Below are examples of a few if/then visualizations.<sup>f14</sup>



f14 If/Then Visualizations allowed the researcher to gain understanding of the cause and effect of each element of the sessions and type of strategic kinesthetic movement.



### Building the Matrix

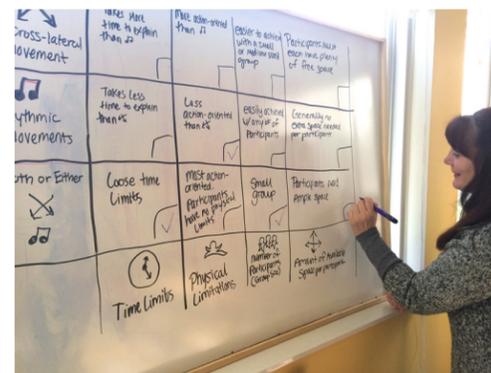
Based upon information gathered during the previous prototyping methods, the researcher began to build a working prototype of the framework.<sup>f15</sup>

Rhythmic Movement	Generally takes less time to explain	Less Physically Intense	Easily achieved with any group size	Small amount of space per person
Cross-lateral Movement	Generally takes more time to explain	More Physically Intense	Easier to achieve with a small or medium group size	Each Participant must have plenty of space
Both or Either	Loose Time Limits	No physical Limitations	Small group size only	Participants have an ample amount of space
	Time Limit for the Method	Physical Abilities of Participants	Number of Participants (Group Size)	Space Available per Participant

f15 An early prototype of the matrix

In the iteration above, the types of strategic kinesthetic movement were along the y-axis, (cross-lateral, rhythmic, both or either), and the factors of the facilitator’s participatory ideation session were along the x-axis, (time limit, physical limitations, group size, and available space per participant). Within the matrix, the quantifiable and related elements are defined in each respective square.

For example, if the facilitator is looking at time limits, they will see that in that cross-lateral movements take more time to explain than rhythmic movements, so if they had some time to spare, they may put a check in the box in the corner of the square combining cross-lateral movements and time limits. Because the facilitator already had an idea of how much time will be allotted toward this method, they are able to judge whether they need something quick or could try something a little bit more complex which takes more time to explain.



Stakeholders tested the matrix by using scenarios to discover which type of strategic kinesthetic movement would be appropriate for each context.

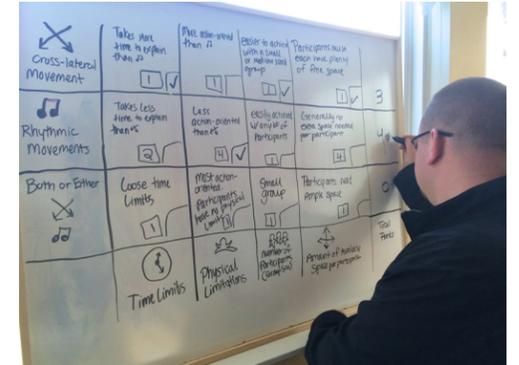
Once the facilitator has put one check mark per column, the facilitator discovers which row has the most check marks. The type of strategic kinesthetic movement that belongs to the row with the most check-marks, is the type of strategic kinesthetic movement suggested to the facilitator in regards to their context.

During evaluation and testing, the facilitators encountered a situation in which they had a participant with limited abilities, but enough time, participants and space for cross-lateral movement. This led to a point system.<sup>f16</sup> Each square was given a value. Once the facilitator places a check-mark in a particular square, the points are assigned to the row in which the check-mark was placed. Once all four rows columns each had one check-mark, the total points for each row was recorded in the far right column. The row with the most points indicates the type of strategic kinesthetic movement the facilitator should use. If there it a tie between two rows, it simply means that the facilitator may choose between the two.

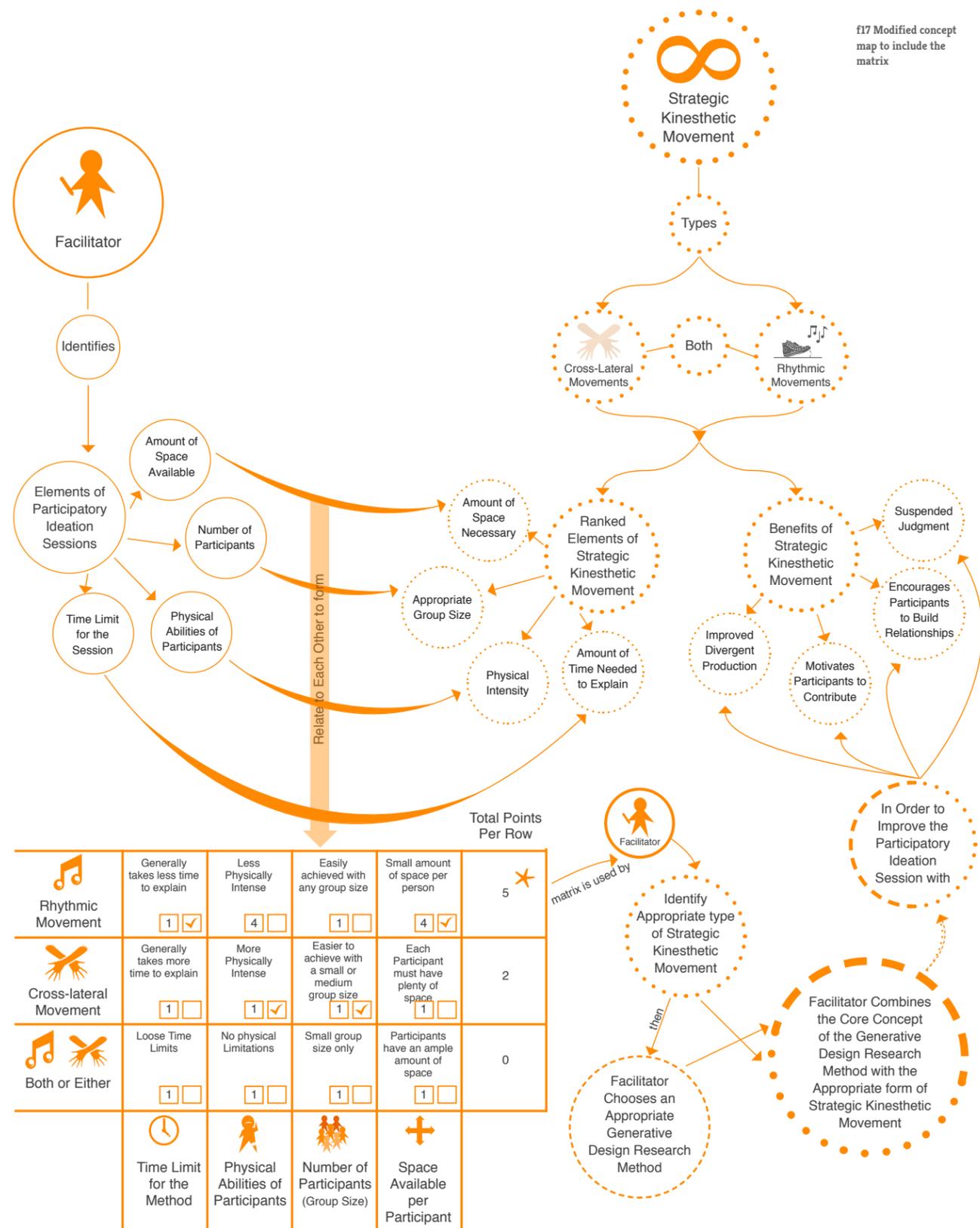
Only squares with a qualifier that renders the other options useless were given a higher number. For example the square that reads, “Small amount of space per person” has four points assigned to it because if the facilitator checks that box, it means that they do not have room for cross-lateral movements, so regardless of the other check-marks, the appropriate option is Rhythmic movements.

f16 The refined matrix with added point values

					Total Points Per Row
Rhythmic Movement	Generally takes less time to explain	Less Physically Intense	Easily achieved with any group size	Small amount of space per person	5
Cross-lateral Movement	Generally takes more time to explain	More Physically Intense	Easier to achieve with a small or medium group size	Each Participant must have plenty of space	2
Both or Either	Loose Time Limits	No physical Limitations	Small group size only	Participants have an ample amount of space	0
	Time Limit for the Method	Physical Abilities of Participants	Number of Participants (Group Size)	Space Available per Participant	



Once changes were made, stakeholders tested the new matrix with point values by using scenarios to discover which type of strategic kinesthetic movement would be appropriate for each context.



Since the matrix had been refined, the researcher also refined the original concept map to include the matrix.<sup>f17</sup> This served two purposes. It allowed the designer to see how the matrix fit within the original insights and it also gave the designer a holistic view of the proposed solution. Viewing the matrix in its context enabled the researcher and stakeholders to see how the matrix functions within the complex context. **With a strong understanding of the context, and the proposed solution, the researcher was ready to develop the final solution.**

## Implement

The fifth and final stage of this design research project was to **Implement** the refined solution from the prototype stage. **Because the implement stage is comprised of the final solution, the details of the final solution can be found in the following chapter, Outcome.**



# Outcome

Through a participatory design research approach, the designer was able to create a concrete solution to the original research question.

## ***How might divergent production during participatory ideation sessions be improved utilizing strategic kinesthetic movement?***

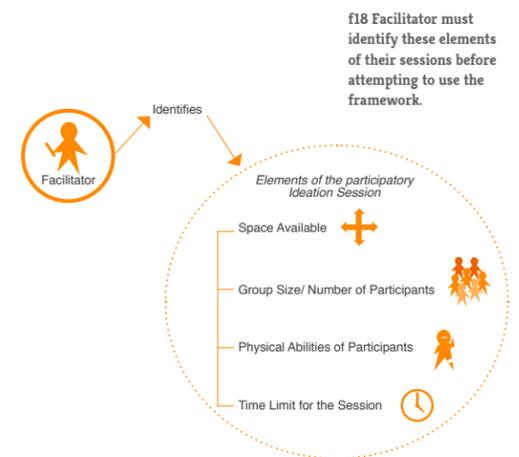


During the first stage of this research project, the researcher collected as much information as possible in order to gain an understanding of the context, as well as to build relationships with the people involved in the project. Preliminary research was conducted in order to define the context and establish a research plan. The researcher identified the stakeholders within the context and included them in the design process. Facilitators and participants had a significant role in shaping the research and lent their perspective and insights to the designer. During the participatory ideation sessions, the researcher and stakeholders were able to witness and demonstrate the strategic kinesthetic movement and the affects that it had on the participants and on the facilitator.

Once the data was collected, the researcher dissected the information in a way which enabled her to assign meaning to each aspect of the context. By breaking down all of the data into understandable and manageable pieces of useful information, the designer was able to identify meaningful patterns and key findings within the data. The researcher utilized multiple methods for analysis which yielded both qualitative and quantitative information.

The key findings indicated that there were challenges that arose with the introduction of strategic kinesthetic movement into the participatory ideation session. Facilitators utilizing the strategic kinesthetic movement would need to know and understand specific elements of their participatory ideation session before integrating the movements.<sup>f18</sup> Furthermore, the same elements which challenged facilitators correlate specifically to the challenges of each type of strategic kinesthetic movement.

Because the methods including strategic kinesthetic movement took a little bit longer to explain, the facilitator must have a conscious sense of their time limits in order to decide which type of strategic kinesthetic movement to include. Since cross-lateral movements typically took more time to explain than rhythmic movements, the facilitator uses their judgment to decide if they have enough time for cross-lateral movement or if they should opt for the less time consuming choice, rhythmic movements.



Facilitators were also concerned with the physical ability of their participants. Before implementing strategic kinesthetic movement, the facilitator must know and understand the physical limitations of their participants. Knowing this will affect their decision when selecting a specific type of movement to incorporate into their method for ideation. Cross-lateral movements were typically more action-oriented than rhythmic movements, and therefore rhythmic movements would be a good choice if the participants have physical limitations keeping them from achieving a higher level of physical activity.

Because cross-lateral movements are more complex, it often takes longer for participants to achieve this movement, and therefore, the facilitator is constantly helping individuals keep their form during the movements. As a result, the cross-lateral movements work better with smaller groups because a small group of participants is easier to aid and control than a large group. The facilitator must know and understand their limits when it comes to group size and the number of participants that they can handle in order to decide on the type of strategic kinesthetic movement appropriate for their session.

The final major element of the participatory ideation session affected by the strategic kinesthetic movement was space. During the methods including strategic kinesthetic movement, participants needed more personal space than needed during the original method. Facilitators must know how much space is available to them for their session and how much free space will be available for the participants to move around during the session. Because cross-lateral movements typically require participants to get up and move around more so than the rhythmic movements, they also require that each participant have more personal space during the method.

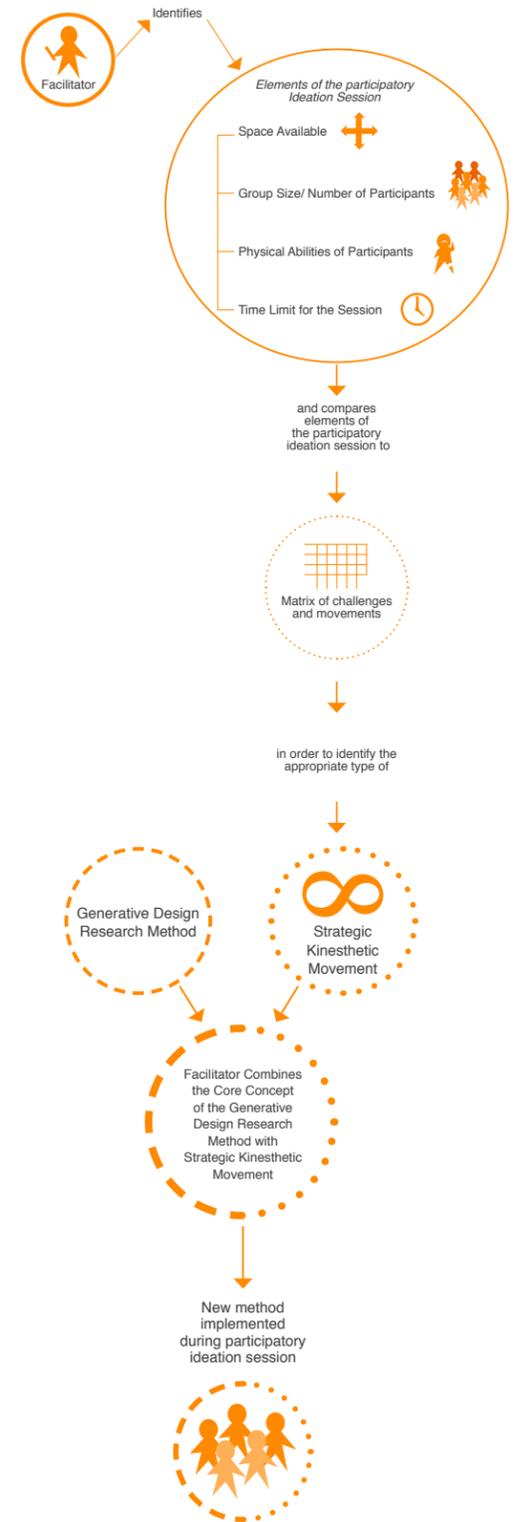
The introduction of strategic kinesthetic movement into the participatory ideation sessions, while initiating challenges, also provided several benefits. Not only did fluency scores increase, but the rate at which ideas were produced increased, thus improving divergent production. Participants were able to build relationships with one another based on a mutual initial discomfort in performing the movements. As a result, participants rarely judged one another's ideas and used humor as a means to encourage ideation.

The strategic kinesthetic movement also provided participants with the opportunity to create their own internal motivation by setting their own individual tempos during each method. Participants used their internal metronome as a countdown to a new idea and began ideating to a beat of their own creation. The repetition of movements motivated them to contribute an idea before the movement was complete.

Facilitators wanted to implement the strategic kinesthetic movement into their own participatory ideation sessions. However, they were uncertain how to infuse their existing generative methods with the movements. During Synthesis, the researcher and stakeholders generated ideas on how to streamline the creation process for designers and non-designers who would like to develop their own methods for use in their own participatory ideation sessions. In enabling facilitators to create their own methods infused with strategic kinesthetic movement, the researcher was also enabling participants to benefit from the strategic kinesthetic movement.

Once ideas were generated, the researcher led the stakeholders through several rounds of prototyping in order to evaluate and select the final solution. Prototyping with the stakeholders allowed the ideas to be tested by the people who may actually utilize this solution in the future. By lending their insights to the evaluation process, they effectively create a solution that reflects their values, needs and desires. Through this process, the stakeholders refined a matrix which may be used to identify the appropriate type of strategic kinesthetic movement to be used in the facilitator's participatory ideation sessions.<sup>f19</sup>

Once the appropriate type of strategic kinesthetic movement is selected, facilitators may integrate the movement into the core concept of the chosen generative method. Keeping the core concept of the method is important because the facilitator must make sure that the method will still be effective and achieve the same goals with strategic kinesthetic movement as it would have originally.



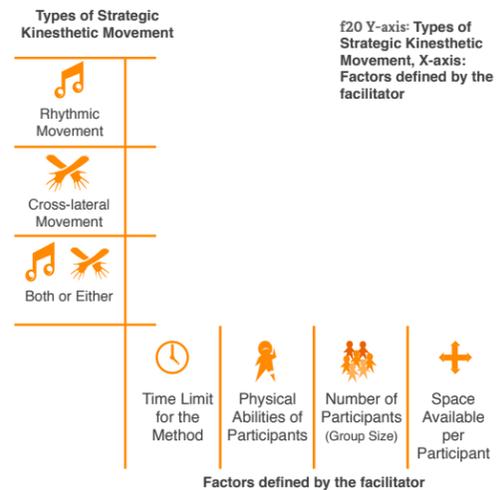
The y-axis of the matrix consists of four options for strategic kinesthetic movement: Rhythmic Movements, Cross-lateral Movements, Both Movements, or Either Movement.<sup>f20</sup>

The x-axis consists of the different elements which must previously be defined and understood by the facilitator before attempting to choose a type of strategic kinesthetic movement. These factors are: Time Limit for the Method, Physical Abilities of Participants, Number of Participants (Group Size), and The Space Available per Participant.<sup>f21</sup>

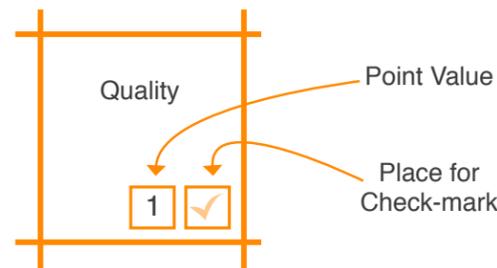
Each unit was given a point value in order to yield results reflecting the research. While most boxes were given the value of 1, two boxes were given the value of 4. This was due to the fact that if either of these boxes were checked, Rhythmic movement would automatically be the best choice for that specific participatory ideation session. For example, one of the units with the point value of 4 is the unit indicating that the facilitator has participants with limited physical abilities and therefore the facilitator should automatically opt for the type of movement which is less physically intense. The other unit with a point value of 4 is referring to the amount of space per participant. If the facilitator is in a type space and each participant only has a small amount of space, cross-lateral movements are not recommended and therefore, rhythmic movements become the facilitator's only viable option.

The final column is reserved for the facilitator to record the total number of points each row has accumulated through the distribution of check-marks.<sup>f22</sup> Each column receives only one check-mark. The facilitator uses their best judgment in deciding which box select within each column. The row with the highest cumulative points indicates the type of strategic kinesthetic movement most appropriate to the facilitators context.

By using this matrix<sup>f23</sup>, facilitators are able to identify the appropriate type of strategic kinesthetic movement for their own participatory ideation sessions and the movement can then be infused with the core concept of any chosen generative design research method. Enabling the facilitators to integrate the movements into their own sessions teaches them the values and benefits associated with strategic kinesthetic movement and gives them a way to improve divergent production within their own participatory ideation sessions.



f21 Breakdown of a unit within the framework.



f21 the column furthest to the right within the framework

Total Points Per Row
5
2
0

					Total Points Per Row
 Rhythmic Movement	Generally takes less time to explain 1 <input checked="" type="checkbox"/>	Less Physically Intense 4 <input type="checkbox"/>	Easily achieved with any group size 1 <input type="checkbox"/>	Small amount of space per person 4 <input checked="" type="checkbox"/>	5
 Cross-lateral Movement	Generally takes more time to explain 1 <input type="checkbox"/>	More Physically Intense 1 <input checked="" type="checkbox"/>	Easier to achieve with a small or medium group size 1 <input checked="" type="checkbox"/>	Each Participant must have plenty of space 1 <input type="checkbox"/>	2
 Both or Either	Loose Time Limits 1 <input type="checkbox"/>	No physical Limitations 1 <input type="checkbox"/>	Small group size only 1 <input type="checkbox"/>	Participants have an ample amount of space 1 <input type="checkbox"/>	0
	 Time Limit for the Method	 Physical Abilities of Participants	 Number of Participants (Group Size)	 Space Available per Participant	

f23 Final Framework for determining the appropriate type of Strategic Kinesthetic Movement.

## Conclusion

With strategic kinesthetic movement making its way into education and business, and design thinking also edging into those same fields, it seems natural that the two could be integrated and referenced by facilitators who are responsible for leading a group through participatory ideation sessions. Design Thinking is a human-centered innovation process, which ultimately influences innovation and business strategy. It refers to applying a designer's sensibility and methods of problem solving to an innovation process.<sup>70</sup> Designers reach out to stakeholders within an opportunity space through design research methods. Often times, the designer will take on the role of a facilitator and conduct meetings with the stakeholders in order to gather information, generate ideas, or evaluate specific concepts.<sup>71</sup> Facilitated sessions in which all stakeholders have to opportunity to contribute equally are referred to as participatory design process facilitation sessions. Participatory ideation sessions are meetings focused on one stage in a design process; the ideation stage. The main objective of the participatory ideation session, is to generate as many ideas as possible. The facilitator is focused on quantity not quality of ideas.

During participatory ideation sessions, facilitators lead groups of participants through organized and strategized agendas, utilizing design research methods with the sole purpose of generating ideas for improving specified opportunity spaces.<sup>72</sup> Generating ideas with the stakeholders allows the designer to gain insight into the stakeholder's point of view, which ultimately aids the designer in creating a meaningful solution to a design problem. The purpose of this design research project is to develop a framework from which facilitators may gain insight and understanding of how to develop their own participatory ideation sessions utilizing strategic kinesthetic movement customized to specific contexts. The development of these participatory ideation sessions will involve the making and manipulation of generative methods and tools revolving around strategic kinesthetic movement.

Designers working as facilitators utilize movement for many reasons. Movement increases productivity, confidence, creativity, and focus during facilitated sessions. Movement elevates the average body temperature which is a sign of greater blood circulation, which means more oxygen is arriving at the brain, making concentration easier.<sup>73</sup> Movement has also been proven to improve self esteem,<sup>74</sup> potentially enabling participants to contribute more ideas without fear of being judged. The absence of judgment allows for an increase in divergent production during participatory ideation sessions. Divergent production is defined as producing from one's memory storage a number of alternative items of information to meet a certain need, either in exact or in modified form, as in thinking of alternative tools that might be used in opening a package.<sup>75</sup>

Through participatory design research, it was discovered that by utilizing strategic kinesthetic movement during participatory ideation sessions, divergent production was improved. Therefore, facilitators and participants became stakeholders in an intricate ideation process allowing them to develop an interest in the outcome. Facilitators and participants identified challenges and elements to the participatory ideation session affected by the introduction of strategic kinesthetic movement.

By integrating the challenges and benefits of strategic kinesthetic movement, the designer and stakeholders were able to develop a framework from which facilitators may gain insight and understanding of how to develop their own participatory ideation sessions utilizing strategic kinesthetic movement customized to their specific contexts. The framework took the form of a matrix.

The facilitator, using their knowledge of the four elements, (Time Limits, Space Per Participant, Number of Participants, and Physical Abilities of Participants), is able to determine which form of strategic kinesthetic movement is appropriate for their context. Then, using the information gained from using the matrix, the facilitator is able to integrate the appropriate type of strategic kinesthetic movement into a generative method of their choice. The method is then implemented during a participatory ideation session and the stakeholders benefit from the affects of the strategic kinesthetic movement.

**Enabling the facilitators to integrate strategic kinesthetic movements into their own participatory ideation sessions encourages them to experience the values and benefits associated with strategic kinesthetic movement and gives facilitators and participants the opportunity to improve divergent production using their own methods for ideation.**

## Future Implications

Several areas of opportunity for future research, based on the research done in this project, have been identified by the researcher.

*1. How might we determine which original methods are better suited to the integration of strategic kinesthetic movement?*

Enabling designers and non-designers to create their own generative methods infused with strategic kinesthetic movement may result in a large amount of new generative design research methods utilizing strategic kinesthetic movement. Future research may include which methods were most effective, or least effective, and why. Assessing the qualities of the individual generative methods, and their areas of strength and weakness, may lend more understanding to developing more efficient methods including strategic kinesthetic movement in the future.

*2. How might strategic kinesthetic movement be utilized during moments of convergence?*

Because diverging and converging are conceptually opposite actions within the creative process, it stands to reason that if strategic kinesthetic movement affected the diverging process, it may also affect the converging process. Understanding which elements of strategic kinesthetic movement affect the converging process and how they affect the process could possibly create the opportunity for convergent methods to be infused with strategic kinesthetic movement.

*3. How might strategic kinesthetic movement be utilized during each phase of a design process?*

This research project took place within the context of ideation, however strategic kinesthetic movement may be useful during other stages of a design process. For example, how might strategic kinesthetic movement be used during Analysis? Can it be used? What are the benefits of use? How is analysis affected by the introduction of strategic kinesthetic movement? All of these questions represent opportunities for further exploration within all phases of a design process.

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# Literature Review

A Collaborative Project. OWP/P Architects + VS Furniture + Bruce Mau Design. [The Third Teacher 79 Ways You Can Use Design to Transform Teaching & Learning](#). New York: Abrams, 2010.

This book contains interviews from educators and design thinkers from all over the world. Many of the chapters and interviews are based on the need for movement in education.

Basadur, Min, Dr. Simplex, a Flight to Creativity. Canada: The Creative Education Foundation, Inc., 1994

Dr. Min Basadur Min Basadur's book, Simplex: A Flight to Creativity, outlines the creative problem solving process known as the Simplex Process. This research project will operate through a process which takes from the Simplex Process called the CASPI (Collect, Analyze, Synthesize, Prototype, Implement) process.

Coel, Dawn Podulka, James M. Pivarnik, Christopher J. Womack, Mathew J. Reeves, and Robert M. Malina. "Effect of Physical Education and Activity Levels on Academic Achievement in Children." *Med. Sci. Sports Exerc.*, Vol. 38, No. 8, pp. 1515–1519, 2006

This article offers an in-depth study of the effects of physical education on children and their learning process. This article also discusses the disconnect in education surrounding physical education programs being reduced or cut completely in response to growing pressure for high test scores.

Dubberly, Hugh, and Shelley Evenson. "The Analysis- Synthesis Bridge Model." *Interaction, Software, and Service Design* Dubberly Design Office. Dubberly Design Office, n.d. Web. Jan. 2012. <<http://www.dubberly.com/articles/interactions-the-analysis-synthesis-bridge-model.html>>.

This article contains a compilation of several versions of the creative process from several different designers. Each model introduces a new way for designers to work from the *Analysis* phase to the *Synthesis* phase. Vijay Kumar's model is CASPI: Collection, Analysis, Synthesis, Prototyping, and Implementation. This is the model of thinking used to complete this design research project.

Graham, George, Shirley Ann Holt/Hale, and Melisa Parker. *Children Moving, A Reflective Approach to Teaching Physical Education*. 7th ed. New York: McGraw-Hill, 2007.

This book offers multiple frameworks for teaching through motion. This book also details specific skills that are developed through specific movements.

Guilford, J. P. [The Nature of Human Intelligence](#). New York: McGraw-Hill, 1967

J.P. Guilford is known for identifying the characteristics of divergent thinking and creating framework in which divergent thinking and creativity may be measured. The measurement tool works to measure three main components of divergent thinking. These are fluidity, flexibility, and originality of ideas. Guilford defines divergent production as an element of divergent thinking which presents itself in the form of ideas and may be measured with fluency or flexibility depending on whether the researcher is looking for quantity of divergent production, or quality of divergent production. In this research project, divergent production was measured based on fluency due to the context of participatory ideation sessions.

[The Handbook of Creativity](#), Ed. Robert J. Stein. Cambridge, UK: Cambridge University Press, 1999.

The Handbook of Creativity offers information about how creativity is measured, tests used to evaluate creativity, and different variables that make up creativity. The research of Wallach and Kogan is instrumental in understanding divergent production. The circle activity was derived from the research of Wallach and Kogan as well as the prompts used in all participatory ideation sessions during this research project. In order to prompt divergent production, Wallach and Kogan ask questions like, “What are the uses for a cup?” or “Name things that have wheels.” These prompts were adopted into participatory ideation sessions conducted during the *Collect* phase of this research project.

Hannaford, Carla, Ph.D. [The Dominance Factor: How Knowing Your Dominant Eye, Ear, Brain, Hand and Foot Can Improve Your Learning](#). Salt Lake City, Utah: Great River Books, 1997.

Hannaford is a biologist and educator. She is able to articulate the effects that cross-lateral movements have on the body and brain. This book lends understanding of the biological and psychological process of enhancing creativity through the use of movement.

Howard-Jones, Paul. “Neuroscience and Education: Issues and Opportunities.” [Teaching and Learning Research Program, Economic and Social Research Council](#), 2011

Paul Howard-Jones was a graduate student in the Graduate School of Education at the University of Bristol. This paper highlights first-hand opinions from professionals in the fields surrounding the topic of brain-based learning. In this article, there is a letter from Ian Diamond, educator and Chief Executive of The Economic and Social Research Council in the UK. In this letter, Diamond states that there are many brain-based learning programs out there but only a few are actually ground in reliable research.

“Improve.” Merriam-Webster.com. 2011. <http://www.merriam-webster.com> (8 December 2012).

The researcher needed a definition for “improve” that was void of context.

Jensen, E. [Enriching the Brain: How to Maximize Every learner's Potential](#). San Francisco, CA: John Wiley & Sons. 2006.

Eric Jensen has dedicated his life to learning. He is known for his advancements in brain-based learning and his program incorporating neurological findings into the classroom. In this book, Jensen describes the effects that movement has on the brain and on students, stating that movement enhances brain activity and also raises confidence.

Jerry V. Teplitz, J.D., Ph.D. ©1992, updated in 2001  
Published in Brain Gym® Journal as part of “A Revolution in Training: Bottom Line Results of the Switched-On Selling Seminar,” Volume XV, Nos. 1 and 2, 2001

This article describes, in detail, a study which was conducted in a business context. The businessmen and women were taught how to use movement in their place of work to motivate each other, handle rejection and judgment, and work as a group.

Kaner, Sam, Lenny Lind, Catherine Toldi, Sarah Fisk, and Duane Berger. [Facilitator's Guide to Participatory Decision-Making](#). San Francisco: Jossey-Bass, 2007.

This book defines the role of the facilitator during participatory sessions. The responsibilities and challenges are outlined in a framework for a participatory decision-making session. This book includes instructions to help the facilitator to lead the participants through cycles of divergent and convergent thinking.

Kelley, Tom. [The Art of innovation: Lessons in Creativity from IDEO, America's Leading Design Firm](#). New York: Random House, Inc., 2001.

The CEO of IDEO, a design firm focused on human-centered design to help organizations innovate and grow, gives an inside look into the process that they use. One of the main stages in their design process is prototyping. Their definition and explanation of prototyping were an asset during this project.

Kelley, Tom. [The Ten Faces of Innovation](#). New York: Random House, Inc. 2005.

Prototyping was a main point in this book. Kelley explains the importance of having more than one prototype in the beginning of every prototyping meeting. This is so participants or clients do not only see one idea and think that they have to be nice and accept that idea. By providing the stakeholders with multiple prototypes, the designer is giving them the opportunity to be honest and give harsh feedback.

Kolko, Jon. [Exposing the Magic of Design](#). New York: Oxford University Press, 2011.

Kolko focused on analysis and synthesis in this book and provides multiple methods for both phases in a design process. Kolko describes each method, how to do it, and what it yields. There are detailed instructions so that the designer may experience it for themselves. In regards to this research project, the researcher practiced Kolko's method for unpacking the data in which the designer asks of each piece of data, "What do I see?", "What does it mean?", and "Why does it matter?". The researcher also practiced kolko's described method for sensemaking and used that as a starting point for the method, "Visual Sensemaking." Concept maps were also researched through Kolko.

Kolko, Jon. [Thoughts on Interaction Design](#). 2nd ed. Burlington, MA: Elsevier, Inc., 2011.

While this source focused mainly on interaction design, many of the methods discussed in this book were transferable into this research project. The researcher worked from Kolko's models of concept maps in order to understand how her own concept map might look.

Kumar, Vijay. [101 Design Methods A Structured Approach for Driving Innovation in Your Organization](#). Hoboken, NJ: John Wiley & Sons, Inc., 2013.

Kumar provides the reader with multiple methods to be used during each step in any design process. He provides details on how each method is used, why it is used, when it is used, and a real-life example of when most of the methods were used. The researcher looked to this book for methods for ideation and used the Opportunity Mind Map with participants during the Synthesize phase of this design research project.

Lidwell, William, Kritina Holden, and Jim Butler. [Universal Principles of Design](#). Beverly, MA: Rockport Publishers, Inc., 2010.

This book serves as an index to the principles of design. Each principle is explained and demonstrated thoroughly. The researcher looked to this source for a definition of prototyping as it occurs in a design research process.

Lockwood, Thomas. [Design Thinking Integrating Innovation, Customer Experience, and Brand Value](#). New York: Allworth, 2010.

This book discusses design leadership and design strategy. Lockwood also wrote about how design thinking, design leadership, and design strategy have influenced innovation in businesses.

Mahon, Nick. [Ideation Idea Generation: The Formation of Ideas and Concepts Ethical: Awareness/Reflection/Debate](#). Switzerland: AVA Publishing, 2010.

This book clearly defines the concept of ideation. Many methods for strong ideation sessions and examples of outcomes from strong ideation sessions are provided. The researcher obtained her definition of "participatory ideation sessions" from this source.

Martin, Roger. [The Design of Business, Why Design Thinking is the Next Competitive Advantage](#). Boston: Harvard Business Press, 2009.

Martin discusses how design thinking fits into the business world. This book defines the concept of "the knowledge funnel" which takes ideas from the stage of "mystery" to a manageable amount, "heuristic", to an organized system Martin calls an, "algorithm."

Meyer, Pamela. [From Workplace to Playspace: Innovating, Learning and Challenging Through Dynamic Engagement](#). San Fransisco, CA: Jossey-Bass, 2010

This book offers a facilitator's viewpoint of play in the workplace. Meyer defines play and the effect that play has on people.

Restak, Richard, M.D. "The Creative Brain." [Creativity](#). Ed. John Brockman. New York: Touchstone, 1993. 164-175

Richard Restak is a neurologist and a neuropsychologist. In this article, Restak articulates the connection between cross-lateral movement and creativity. This article lends understanding of the scientific research behind the theory of strategic kinesthetic movement.

Stone, Terry Lee. [Managing The Design Process](#). Beverly, MA: Rockport Publishers, Inc., 2010.

<http://dictionary.merriam-webster.com>

"improve" was defined using an online dictionary because the researcher wanted to find a definition without a context so that it may be transferable into this research project.

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