

Running head: Lala Mamedov Research Design

Research Design: Group Problem-Solving

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Table of Contents

Contents

Research Design: Group Problem-Solving.....	1
Table of Contents	2
Collaborative Problem-Solving: Research Design	3
Research Problem	3
Method	4
Participant Selection and Sample Size.....	5
Data Collection Procedures.....	6
Data analysis plans.....	7
Credibility issues.....	8
Ethical considerations	9
Timeline	9
Appendix A.....	11
Pre-screening survey questions.....	11
Appendix B	12
Interview questions	12
Appendix C	14
Examples of Outcome Space	14
References.....	17

1 Collaborative Problem-Solving: Research Design

2 *Research Problem*

3 In most cases, when a person is faced with a challenge or a problem, he resolves it
4 through an individual cognition process, and by accessing his personal knowledge base, which
5 may include known facts, information and existing experience in solving similar problems, plus
6 the knowledge about how and where to access additional resources. This type of problem-solving
7 is a solitary and slow process, and may be quite inefficient, especially in a time-sensitive
8 situation. It may also be ineffective if the prior experience or readily available resources are not
9 adequate for the particular type of the problem. In some environments, people are beginning to
10 turn to collaborative problem-solving instead. More often than not, this collaborative problem-
11 solving is not a part of a structured, well-defined issue resolution process, but rather is a product
12 of self-organized, ad-hoc collaboration between weakly connected, cross-functional team
13 members. Experts and non-experts "swarm" over a problem until it is resolved. Only one person
14 in this group has the actual responsibility to resolve the problem, and yet the group assumes
15 collective ownership of the challenge. The groups are typically very small – 3-7 people. None of
16 the participants in this collaborative problem-solving event may have the complete knowledge
17 set that would allow them to solve the problem individually, but by integrating their individual
18 experiences and knowledge banks, they co-construct the new knowledge about the problem at
19 hand that gives the group the tools to solve the problem.

20 I am interested in understanding and describing the qualitatively different ways that the
21 participants in these “swarms” make meaning of their experience. My main research question is:
22 “How do people in collaborative problem-solving groups understand their experience?” If we

23 knew more about how the individuals involved understand their experience, it might help us
24 understand the genesis, operation, dissolution, and re-emergence of such groups.

25

26 *Method*

27 The method I am planning to use is phenomenography. The reason I am considering this
28 method is that it is well-suited for understanding the experiences of people, and especially for
29 uncovering the differences between the ways people process their experiences.

30 Phenomenography is a second-order research method. In the first/second order
31 dichotomy, first-order research describes the phenomenon as the researcher experiences it, while
32 second-order research method focuses on other's descriptions and experiences with the
33 phenomenon. Phenomenography originated in Europe as a method to explore students'
34 conceptions of a learning process (Booth 1997; Marton 1981a; Marton 1981b; Marton and Booth
35 1997; Marton and Pang 2006; Renstrom, Andersson and Marton 1990). The method has since
36 been applied to other group learning and sense-making scenarios (Andretta 2007; Collin 2006;
37 Osteraker 2002; Paloniemi 2006; Prewitt 2005; Vallee 2006). A particular strength of
38 phenomenography is its focus on the differences between the way individuals experience a
39 process or a part of a process. As a result, the variety of points of view can create a rich fabric of
40 meaning. In addition to enriching our knowledge of the meaning-making, phenomenography
41 offers a strong practical application: since some ways of understanding the experience are more
42 productive than others (Marton 1994), focusing individuals on understanding their experience in
43 these more productive ways will help them to contribute and cooperate better. With this in
44 mind, an ordered and prioritized list of people's conceptions may help managers coach and
45 mentor employees to support and promote the valuable mindsets. It also may help create better

46 problem-resolution outcomes by focusing participants on a particularly productive way of
47 framing the experience, and accelerate knowledge transition from tacit to explicit.

48 *Participant Selection and Sample Size*

49 My data will be comprised of the transcripts of in-depth interviews with the participants
50 of several problem-solving groups. The peer collaboration that I am interested in is frequently
51 observed within technical support and service organizations, where highly skilled support
52 engineers are tasked with diagnosing and resolving technical issues that the organization's
53 customers are experiencing. I am planning to conduct research within one or more of the
54 technical support teams at my employer, Intuit. To avoid conflict of interest and researcher's
55 bias, I will not be using my own team as a setting.

56 My dataset will be comprised of the transcripts of recorded, semi-structured interviews
57 with individuals who participated in a group problem-solving activity within the past two
58 months. I am choosing the two months interval because the memory should still be fresh in the
59 participants' minds, while the interval is long enough to ensure that there were enough
60 completed troubleshooting events to yield enough materials for the study.

61 In phenomenographic literature, a sample size of 15-20 is considered optimal. A smaller
62 sample may not reveal all the possible variations of meaning-making, while a larger sample
63 tends to not add any additional variations (Sandberg 2000).

64 The first step in recruiting participants will consist of sending out a pre-screening survey
65 to identify people who participated in one of the problem solving groups within the past six
66 months (See Appendix A).

67

68 I will send the survey to all of the support engineers at Intuit, a total population of about a
69 thousand people. The group problem-solving is not a very frequent occurrence, so I expect the
70 initial survey to yield about a hundred potential participants. Phenomenographic research is
71 focusing on experiences of people participating in the same event, so my goal would be to enroll
72 several intact problem-solving groups. To get to the sample size of 15-20, I will use snowball
73 sampling: I will randomly select one person from the pool of potential participants, and ask this
74 person to identify other members of the problem-solving event; the rest of the group will be
75 invited to participate in the research. I will repeat this process until I arrive at a sample size of
76 about 15-20.

77 *Data Collection Procedures*

78 My process for data collection will consist of a set of individual semi-structured
79 interviews. The interviews will be conducted face to face at the participants' workplace, at the
80 time of their choosing. The interviews will be recorded using two digital recorders – a primary
81 one and a backup in case of equipment failure. The interviews will be transcribed verbatim and
82 analyzed according to the established phenomenographic protocol.

83 The purpose of the interviews is to have the participants freely narrate their
84 experience in participation in the problem-solving groups. Marton (1994) emphasized that the
85 participants should be encouraged to describe their experience unprompted, and therefore the
86 interview should not have a detailed list of questions prepared in advance. The questions will
87 emerge in response to the participants' statements. Ideally, little intervention from the researcher
88 will be required. If the participants are lacking in self-introspection and are unable to articulate
89 their experience, the researcher can prompt the participant with additional questions. Please see
90 Appendix B for an outline of possible interview questions.

91 *Data analysis plans*

92 The unit of analysis in phenomenography is not an individual but the variation in the way
93 individuals are experiencing a particular phenomenon (Marton and Booth 1997). The
94 phenomenographic analysis is done in the iterative manner, through repeated reading and
95 examination of the transcripts. In the initial reading, I will indentify the ways the participants are
96 describing their experience in participating in group problem-solving. On the second pass, the
97 identified concepts are applied to the segments of the text. The next step is to group together the
98 concepts according to their similarities; these groups, or themes, are called categories of
99 description. Finally, the categories of description are analysed to uncover relationships and
100 hierarchies. I will determine how they categories are structurally related to each other, and order
101 them from the less complex and complete to the most complex and complete. This final output of
102 prioritized concepts and relationships between them is called the outcome space, representing the
103 full range of possible ways the phenomenon was experienced by the participants. Marton
104 described this outcome space as the empirical representation of the collective mind (Marton,
105 1996).See Appendix C for examples of outcome spaces from other researchers.

106 It is important to note that at the end of the research process, I will not be going back to
107 the participants asking them to comment on or confirm my analysis. The purpose of
108 phenomenographic research is to describe the variation between experiences: the unit of analysis
109 is the variation of meaning-making and not the individuals or the phenomenon itself. Therefore,
110 it is impossible to comment on the outcome space without looking at the full data set. I will,
111 however, share the results of my research with all the participants.

112 *Credibility issues*

113 Researcher bias is a common concern in qualitative research, as it may impact reliability.
114 One of the most common methods of establishing reliability in qualitative research is using
115 multiple analyzers. There are two approaches to this: we can have a group of researchers
116 investigate the material together and agree on categories, or we can have the lead researcher
117 categorise the text independently, and then hand the categories with descriptions to another
118 researcher that should look at the transcripts and see if the categories are relevant to the text
119 (Walsh 2000). Some phenomenographers argue that interrater reliability is counterproductive
120 because it is based on objectivist epistemology and is theoretically and methodologically
121 inconsistent with phenomenography (Sandberg 1996). Phenomenography is based
122 phenomenological epistemology, with the foundational premise that knowledge is purposely
123 constructed through people's conceptions of reality. Instead of objectivist stipulation that
124 objective knowledge exists as the single source of truth, phenomenography is taking the non-
125 objectivist approach. Therefore, not only is the knowledge of a phenomenon constructed
126 individually by the participants, but also the understanding of the participants' experience is
127 individually constructed by a phenomenographer. In this context, interrater reliability is
128 meaningless. Instead, the researcher could use a technique called bracketing, or epoche
129 (Ashworth and Lucas 1998). Bracketing requires the researcher to set aside presuppositions and
130 preconceptions about the phenomenon, clearing way to careful and thoughtful listening to the
131 participants.

132 The validity of the phenomenographic research is based on the detailed justification for
133 selection and arrangement of the categories.

134 *Ethical considerations*

135 My research is dealing with human subjects, and as such will be in line with IRB
 136 requirements. All the participants will sign an informed consent form, with clearly articulated
 137 expectations and protection measures. While the subject matter under investigation is unlikely to
 138 produce any distress or discomfort for the participants, their confidentiality and anonymity shall
 139 be assured and guaranteed. All the recordings and transcripts will be marked by code names
 140 only, with the master key held in a secure location.

141 Another possible ethical consideration may be related to power structure in the company.
 142 While the participants will not be in my direct chain of command, I am still a member of the
 143 company's leadership team, and as such have a position of power. In my opinion, my research
 144 problem is unlikely to cause discomfort or embarrassment to the participants: I will be focusing
 145 on people's understanding of their experience of participation in group problem-solving, which
 146 is generally a positive experience for participants. In addition, participation in these events is a
 147 valuable but purely voluntary activity, and is not a part of people's job responsibilities or
 148 performance goals. To avoid any remote possibility of coercion, I will explain that there is no
 149 obligation to participate in my research, and the anonymity of the participants will be strongly
 150 protected.

151 *Timeline*

Phase	Duration	Elapsed time
Pilot	2 months	2 months
Pre-screening	1 month	3 months
Snowball interviews	2 weeks	3.5 months
In-depth interviews	2 weeks	4 months

Transcription	4 weeks	5 months
Data analysis	5 months	10 months

152

Limitations

- 153 1. Demographics – the results may be specific to the particular demographic of the participants
- 154 2. Industry-specific – the research will be conducted in a high-tech company; the results may be
155 different in other industries
- 156 3. Lack of triangulation – the research could be enriched by applying narrative analysis to the
157 group problem-solving interactions. The challenge in doing so is to be able to be in the field
158 when the group problem-solving event is occurring.

159

Definition of terms

160 Group problem-solving: a problem-solving event where several people collaborate on solving a
161 complex problem that cannot be immediately solved by any one of the participants.

162

163

164 .

Appendix A

Pre-screening survey questions.

As a doctoral student at Fielding Graduate University, I am studying individual experiences in participating in group problem-solving events. The research will help us better understand how this problem-solving works, which should help people get better at it and improve issue resolution outcomes.

This brief survey is to determine whether you have had recent experience in participating in such events.

1. Does your daily work involve identifying and resolving technical problems?
2. Thinking back to the past six months, do you recall asking your co-workers for an advice in dealing with a particular technical problem you were working on?
3. Do you recall having multiple people (three or more) involved in discussing the problem you brought up?
4. Did this conversation ultimately lead to a successful resolution of the problem?
5. Thinking back to the past six months, do you recall having been involved in a group discussion of a technical problem that someone else brought up?
6. Was solving that problem your direct responsibility?

*Appendix B**Interview questions.*

I am conducting research into individual experience in participating in small problem-solving groups. Specifically, I am interested in understanding and describing the qualitatively different ways that the participants in these groups make meaning of their experience. As we agreed in the earlier conversation about this process, I will be making an audio recording on this interview, and will later transcribe it for use in my research. Is that still OK with you?

Some initial questions:

1. What does problem-solving mean to to you?
2. I would like to discuss the steps you go through to troubleshoot a problem, and why you go through them.
3. How long do you usually work on a problem?
4. At what point to you realize that you need help or advice from others?
5. How do you go about looking for help if you cannot find the answer on your own?
6. How do you decide who to ask for assistance?
7. Did the people you brought in invited others?
8. Thinking back to the most recent group problem-solving event, how many people in total participated?
9. Please describe your experience of being in the problem-solving group?
10. How was this experience different from working on a problem on your own?
11. What have you learned at the end of the process?

The interview is designed to draw out people's reflections and insights, and will be largely driven by the participant's statement and comments. The questions will be framed to elaborate on the utterances: for example, "When you use this term, what do you have in mind?", "Can you explain what you mean by that?", and "Can you give an example of this?"

Appendix C.

Examples of Outcome Space

Example 1. Vana Pewitt's depiction of outcome spaces of adults' making meaning of nonformal learning situations.(Prewitt 2005)

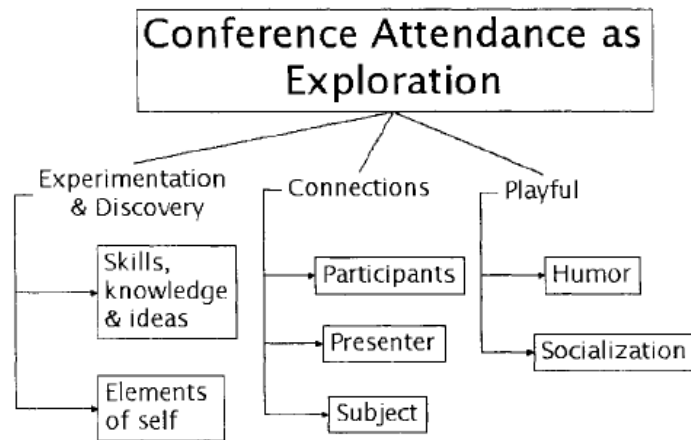


Figure 4. Relational outcome space of nonformal learning

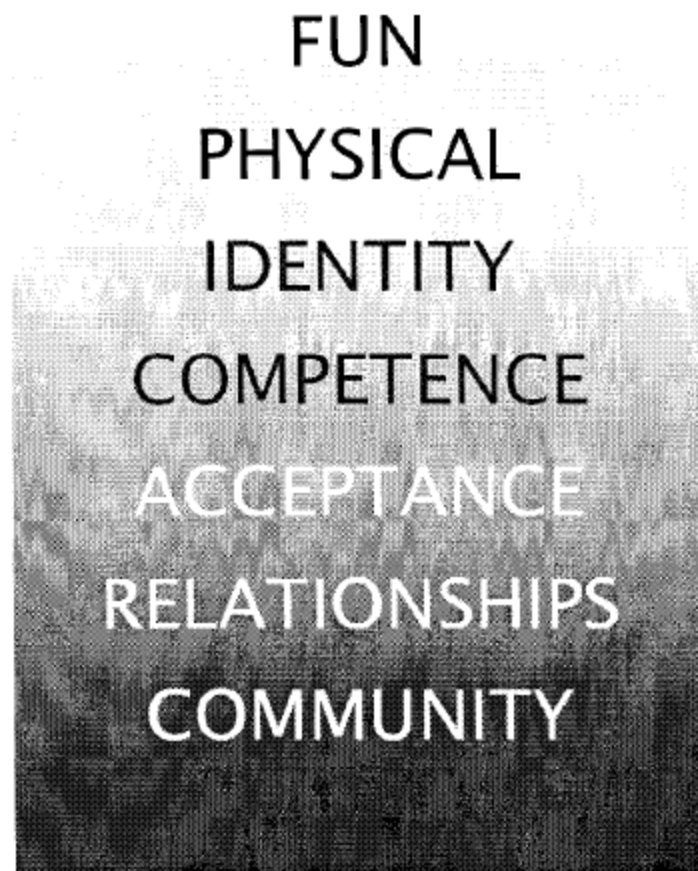


Figure 5. Structural outcome space

Example 2. Jason Charles Vallee's outcome spaces for variations in students' conceptions of an online graduate learning experience (Vallee 2006).

Sense of Self	Depth of Learning		Quality of Learning
Self out to the world	Surface	Categories	
↓	↓	1. Learning as the accumulation of knowledge	↑
↓	↓	2. Learning as memorizing and reproducing	↑
↓	↓	3. Learning as application	Quantitative
↓	↓	4. Learning as understanding	Qualitative
↓	↓	5. Learning as seeing something in a different way	↓
↓	↓	6. Learning as changing as a person	↓
Self merge w/ reality	Deep		

Figure 1: Categories of description - Dahlin.

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