

## **Creating a Double Loop Learning Climate**

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### **Creating a Double Loop Learning Climate - A Case Study**

As internal facilitators of organizational development, we believe that building increased facilitation skills throughout the organization is important to foster organizational learning that sustains beyond our initial interventions. We began to teach facilitation skills to a broad range of individuals within our organization. One division asked for an advanced facilitation workshop as part of a larger strategic initiative. The participants were engineers and other individuals with heavy technical background and experience. We knew from experience that the skills required to perform successful group facilitation are very different from the skills to perform detailed technical work. The workshop proved successful as measured by participants' response and by the outcome of participants conducting successful facilitation events after the workshop. We were curious about what made the workshop successful. We wondered what conditions were present that helped the learning process and what conditions would have increased learning.

As we designed the workshop we were aware of our being influenced by the work of Chris Argyris and Donald Schön (Argyris, 1993b; Schön, 1983, 1987). In the spirit of action research, we decided to examine this case and attempt to build our own theories of success for this workshop. Additionally, we believe that the theories could be extended beyond developing a facilitation workshop to a broader organizational learning context. The core theory around which we build our theories is Argyris and Schön's notion of double-loop learning (Argyris & Schön, 1974, 1978). We attempt to develop a model of a learning climate that is best suited for double-loop learning.

### Action Science Framework

Argyris and Schön's action science framework was developed to help organizations transform (Argyris & Schön, 1974, 1978) and has been used extensively in organizations and is considered a useful theory (Miner, 2003).

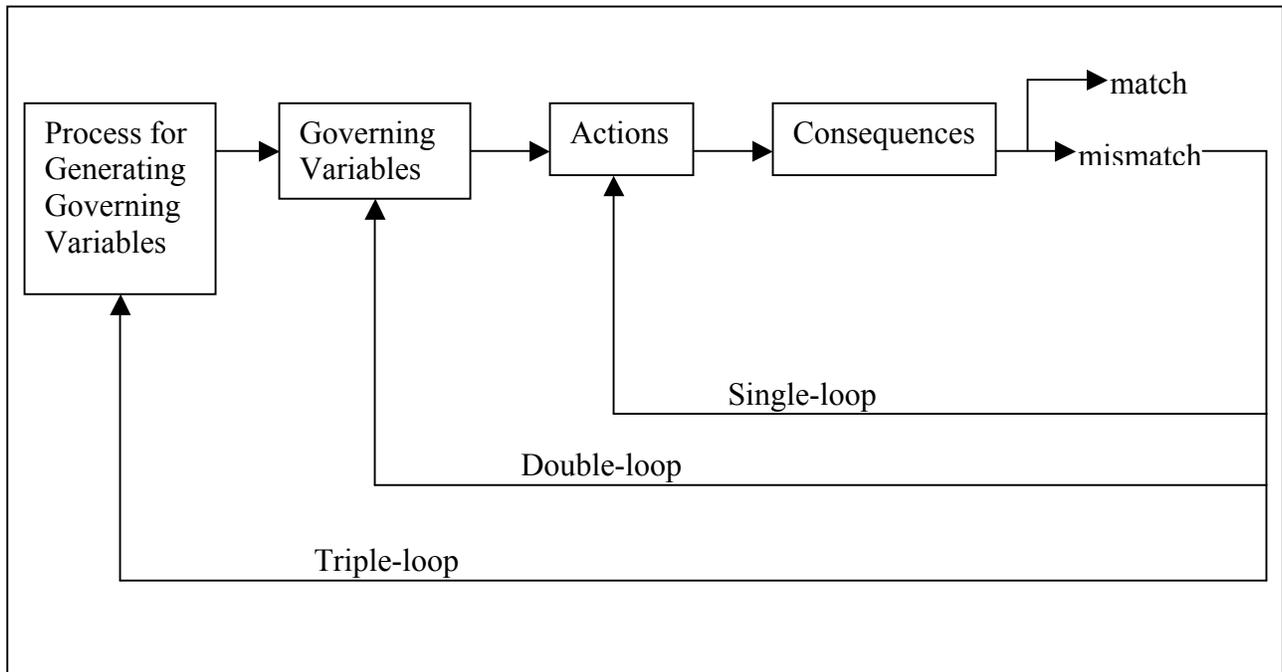
This model adds to a social constructionist view by assuming that there are important differences between what people say and what they do (Argyris, 1993b). What people do is affected by their *theories-in-use* regardless of what they say as their *espoused theories*.

According to Argyris and Schön, Model I theory would hold the main governing variables of (a) achieve the purposes as I perceive them, (b) maximize winning and minimize losing, (c) minimize eliciting negative feelings, and (d) be rational and minimize emotionality. Whereas Model II theory would hold the governing variables of (a) valid information, (b) free and informed choice, and (c) internal commitment to the choice and constant monitoring of the implementation. (Argyris & Schön, 1974; Schön, 1987).

These two models lead to different types of learning, see Figure 1. Model I leads to single-loop learning when a person either achieves their desired goals directly (match) or adjusts their actions to achieve a goal (mismatch). In neither case would the person change their underlying values. Model II theory leads to double-loop learning when mismatches are perceived and the person questions and changes their governing variables and then adjusts their actions.

A model of triple-loop learning has been proposed to occur when people question how they develop their governing variables (Nielsen & Bartunek, 1996; Snell & Man-Kuen Chak, 1998). In other words, they learn about their learning or what Bateson called deutero-learning (Bateson, 2000). This type of learning is linked to ethical practices (Nielsen & Bartunek, 1996;

Yuthas, Dillard, & Rogers, 2004) and allows individuals to question and then modify their social structures of thought and the tradition system in which they are embedded (Seo, 2003).



**Figure 1. Single, double and triple-loop learning. Adapted from Argyris (Argyris, 1993b) and Snell & Man-Kuen Chak (Snell & Man-Kuen Chak, 1998)**

An important condition to single, double and triple-loop learning is the ability to be self-observant and reflect. The reflection process allows for first the awareness of a mismatch and then begins the process of examining our mental models of the world. Self-reflection is part of a process for creating frame experiments (Schön, 1983) which can lead to reframing or new ways of seeing (Steier & Ostrenko, 2000). To create double-loop learning people need to not only be reflective but must be critically reflective on their assumptions (Mezirow, 1998)

Learning new skills requires both single and double-loop learning. When adults need to learn skills that are very different from their current skill set, they will need to develop theories and models that may be radically different from their current set of models, for example

engineers learning group facilitation skills. For this type of learning, double-loop learning is essential for the acquisition of new skills. Radically new skill development would require a fundamental change in a person's mental maps as opposed to an incremental change and fundamental change is associated with double-loop learning (Seo, 2003). This leads to our first hypothesis:

*H1: Development of radically new skills is positively affected by the use of double-loop learning.*

Much of the current literature on organizational development declares that people and organizations will need to acquire many new skills to be successful in the near future (Drucker, 1992; Malone, 2003). If this is true, developing the ability and practice in performing double-loop and possibly triple-loop learning will become increasingly important. However, there is some evidence that double-loop learning does not occur often. Even Argyris says that double-loop learning is difficult (Argyris, 1993b). For Argyris and his followers, the method for moving from single-loop learning to double-loop learning is through confrontive cognitive interventions where people come face-to-face with the inconsistencies of their thinking. He also indicates that there are strategies when intervening which overcome these barriers. We will first examine some of these barriers and then develop a model of factors that affect double-loop learning capabilities.

### **Barriers to Double-Loop Learning**

There are several hypotheses about why double loop learning is difficult. Argyris contends that single-loop learning is self-sealing and self-prophesizing. He further infers from his experience that Model I theories, which lead to single-loop learning, are learned through a socialization process and that most people hold Model I theories (Argyris, 1993b).

Single-loop and double-loop may be associated with other psychological preferences like cognitive style (adaptive vs. innovative) (Korth, 2000) or MBTI (Back & Seaker, 2004). These theories would imply that we are born with or at least develop very early in life, certain preferences of thinking which predisposition us to either single or double-loop learning. However, if these theories are true, Argyris should encounter more double-loop learners than he reports (Argyris, 1993a).

Confronting and overcoming our conditioned defenses can cause emotional reactions which must be dealt with. If people's governing variable is to not exhibit strong emotions, they will not confront or test their assumptions. People may not have a sense that they can cope in such an emotionally charged environment (McMorland & Piggot-Irvine, 1999; Seo, 2003). Double-loop learning may require a well developed sense of coping efficacy or learning self efficacy (Bandura, 1986, 1989a; Bandura & Locke, 2003).

Other barriers to double-loop learning may be at the organizational and the societal level (Seo, 2003). Power differentials within the organization may create defensive routines which inhibit double-loop learning (Blackman, Connelly, & Henderson, 2004). These political obstacles create processes which distort and filter information as people are concerned with their survival and personal well-being. Even larger socioeconomic systemic structures such as globalization and capitalism can influence individual's ability and motivation to test their deeply held assumptions.

Double-loop learning requires that the individual practices reflection (Schön, 1983, 1987). Specifically, double-loop learning requires the individual to perform a critical self reflection of assumptions (Mezirow, 1998). Critical reflection of this nature may be partly a social process where individuals must get feedback from someone else (Convery, 1998).

Organizations do not often create conditions for dialogue (Isaacs, 1999) or create structures that facilitate free and open inquiry (Romme & Witteloostuijn, 1999).

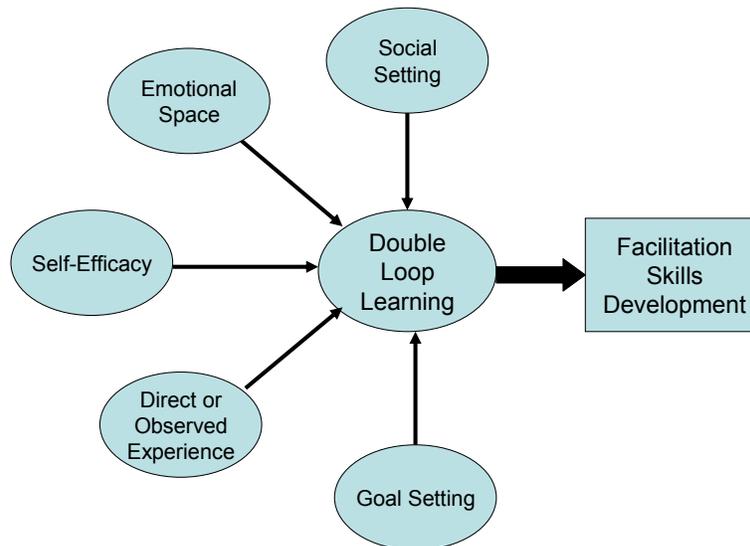
We must consider all of these barriers in designing a learning process that requires double-loop learning. Situations requiring learning radically different skills such as engineers learning facilitation skills, is one example. What are the conditions which create a learning climate that is most conducive to double-loop learning? We propose the following model to answer this question.

### **Double-Loop Learning Climate Model and Hypotheses**

This causal model combines tenants of double-loop learning theory and social cognitive theory to define an effective double-loop learning climate for developing facilitation skills. A learning climate is one in which participants can acquire a skill and have a different capacity for action or performance once they leave the learning climate. This capacity includes knowing what to do, knowing how to do it, and a belief that the individual has the ability to do it. Figure 2 describes the double-loop learning climate model. As shown, each of the conditions is proposed to independently influence the level of double-loop learning. We recognize that there may be correlations between the conditions also, but did not explore those in depth for this paper.

Social cognitive theory is founded on “an agentic perspective to human self-development, adaptation, and change” (Bandura & Locke, 2003, p. 97). The theory includes four core features of human agency (a) intentionality, (b) forethought, (c) self-reactiveness, and (d) self-reflectiveness. Double-loop learning assumes the ability of individuals to cognitively confront underlying beliefs and adapt and change based on that confrontation. Both double-loop learning and social cognitive theory focus on the individual as the actor of change. The similarities in

foundation make it reasonable to use social cognitive theory as a lens to evaluate the conditions that lead to effective double-loop learning.



**Figure 2. Double-Loop Learning Climate**

### ***Social Setting***

Double-loop learning is achieved through cognitive confrontation and by testing reality (Seo, 2003; Woodell, 2003). Knowledge of reality can be shared in a reflexive manner through mutual inquiry and reflection (Lichtenstein, 2000). Reflection in and of itself is a looking back without any judgment or evaluation. Critical reflection involves making an assessment of what is being reflected upon. Critical self-reflection means “reassessing the way we have posed problems, our own meaning perspectives, as well as reassessing our own orientation to perceiving, knowing, believing, feeling, and acting” (van Woerkom, 2004, p. 180). Critical reflection of an assumption involves a more abstract assessment of a belief (Mezirow, 1998). Critical reflection on assumption and self reflection on assumption are key to double loop

learning (Mezirow, 1998; van Woerkom, 2004). An assessment of individually held beliefs is difficult to do without information from outside the individual who currently holds the belief. Therefore, we assert that a social environment is needed for critical self-reflection on assumptions and double-loop learning.

Group facilitation involves flexible and contingent interaction with people in all types of settings making it a social and interactive skill (Schwarz, 2002; Yoong, 1999). The setting for learning the skill should match the nature of the setting where the skill is experienced. Other people need to be present and involved in the learning climate. Skilled facilitators are adept at acquiring and reflecting on feedback from the group participants as well as themselves (Schwarz, 2002).

Schön's work on reflection-in-action and reflection-on-action suggests a mode of learning that is "transactional, open-ended, and inherently social" (Lichtenstein, 2000, p. 48). Convery suggests that "reflection is not a cognitive activity but rather an activity only developed in conducive social and emotional circumstances" (Convery, 1998, p.203). Marianne van Woerkom supports this notion in her research and states "reflection as individual behavior is often less effective than reflection in a social interaction" (van Woerkom, 2004, p. 182). Convery argues that "for reflection to fundamentally influence practice it is necessary that such reflection is informed by collaborative discussion, as individual reflection tends to focus on immediate rather than underlying problems" (Convery, 1998, p. 197). This implies that individual reflection leads to single-loop learning and collaborative reflection leads to double-loop learning. The social setting also provides the opportunity to observe the experiences of others which leads to learning, setting internal standards of competency, and social evaluation of efficacy information

(Bandura, 1986). Argyris implies that the cognitive confrontation required for double-loop learning includes inviting others to confront your views (Woodell, 2003).

*H2: Collaborative reflection increases the level of double-loop learning.*

### ***Emotional Space***

Part of skill building requires practice giving and receiving feedback and reflecting on feedback received. Learning to give and receive feedback should be done in an environment that is non-threatening and supportive (Seashore, Seashore, & Weinberg, 1997). Performance feedback should be structured in ways that build self-percepts of efficacy as well as skill (Bandura, 1986), this requires an environment conducive to building people up while they practice new skills. Double-loop learning involves stepping back and reviewing individual assumptions about how things work. This can generate feelings of surprise, inadequacy, incompetence, and embarrassment (Korth, 2000; McMorland & Piggot-Irvine, 1999) all which need to be dealt with effectively to develop productive new capacities.

Reflection on the impact of the experience on the trainee may include expressions of feelings (Yoong, 1999). From our own experience in learning facilitation skills, having a space to freely convey the impacts of an experience, including emotional reactions, and have the support of others in the reflection process is key to acquiring new capacities as a facilitator. Learning facilitation requires trying new processes and interventions with groups of people, it is easier to do this in a climate that is safe to express emotions and encourages individual risk taking.

*H3: Reflection on emotions increases the level of double-loop learning.*

### *Self-Efficacy*

Perceived self-efficacy is the judgment of personal capabilities to execute a course of action to attain a designated type of performance (Bandura, 1986). Self-efficacy affects several aspects of behavior including choice of activities, personal goals, effort and persistence, and learning and achievement (Ormrod, 2004, p. 143). Skilled facilitation requires recognizing and adapting to changing conditions and selecting from a combination of skills, methods, and tools. Social cognitive theory states that “efficacy involves a generative capability in which cognitive, social, and behavioral sub skills” are organized into course of actions (Bandura, 1986, p. 391). These courses of action would be called interventions in the domain of facilitation. A key outcome of the double-loop learning climate is that participants believe they have the capability to perform an intervention. Self-efficacy is not a global personality trait (Bandura, 1986, p. 411), but rather a belief given a specific task and expected performance. The learning climate must then include conditions where efficacy information is acquired and evaluated by each participant. Sources of self-efficacy include (a) performance attainment, (b) vicarious experiences of observing others, (c) verbal persuasions that the individual possesses the capability, and (d) physiological states (Bandura, 1986).

*H4: The presence of efficacy information increases the level of double-loop learning.*

Argyris states that self-efficacy is required for effective double-loop learning, people with high self-efficacy see challenging assumptions and examining errors as ways to learn and grow rather than personal threats to obtaining a goal (Argyris, 1993b). The knowledge of the difference between Model I and Model II theories in use and possession of the skills to perform Model II behaviors may still be insufficient if the individuals do not believe they have the

capability to take the Model II course of action. Individuals with high self-efficacy would recognize how their own actions and beliefs lead to a course of action and be capable of challenging their own beliefs.

Double-loop learning involves the recognition and evaluation of feedback, on firmly held beliefs and assumptions. Recent research examining the effect of upward feedback on managers reports that the self-efficacy of feedback recipients moderates the beneficial effect of upward feedback (Heslin & Latham, 2004). There are different aspects of perceived self-efficacy, for this model we focus on learning self-efficacy as a contributor to effective double-loop learning. This hypothesis would partially test Bandura's statement that "in the skills development phase, a high sense of learning self-efficacy serves a positive promotive function" (Bandura & Locke, 2003, p. 96).

*H5: Perceived learning self-efficacy increases the level of double-loop learning.*

### ***Direct or Observed Experience***

Facilitators in training reflect both on their own experiences and what they observe others doing (Yoong, 1999). Social cognitive theory states that humans can develop skills or change behaviors from observing models of the skill they aspire to acquire as well as from direct experience or practice (Bandura, 1986). The process of knowing is not separate from action (Kolb, 1984; Lichtenstein, 2000) and requires experience through transactions with the environment. People develop standards of performance and set goals based on observing and comparing their performances to others' performances (Bandura, 1986). Argyris states that learning does not occur when someone merely discovers a solution to a problem but rather learning only occurs when the person sees a match or mismatch when the solution is actually

produced (Argyris, 1993b, p. 9) The learning climate should include accurate modeling of the skills to be acquired as well as practice and experimentation of the new skills.

*H6: Accurate modeling of new skill increases the level of double-loop learning.*

*H7: Practice of the new skill increases the level of double-loop learning.*

### ***Goal Setting***

Personal aspirations and self-set goals are another condition for double-loop learning. These provide the motivation to examine assumptions and learn new ways of behaving. Individuals become motivated to take action as they set goals for higher levels of competency and compare themselves to these cognized standards (Bandura, 1989a). The standards may be set by self referent thought and by observing performances of others. For this model we are taking the social cognitive theory perspective of expectancy outcome rather than the expectancy-value theory perspective (Bandura & Locke, 2003).

In social cognitive theory humans are proactive and forward looking. “Then extend their aspirations distally well beyond their proximal performance level and override a lot of negative feedback along the way. Through this proactive self-management they turn high aspirations into reality” (Bandura & Locke, 2003, p. 93). Setting expectations for outcome and establishing personal goals are influenced by efficacy beliefs. People exclude classes of potential outcomes on self-efficacy grounds, not considering a potential outcome because they lack belief they can achieve it (Bandura & Locke, 2003).

*H8: Setting personal goals for learning increases the level of double-loop learning.*

### **Verifying the Model and Case Study**

Our proposed model could and should be tested and analyzed rigorously. The hypotheses and model was designed with a quantitative study in mind, however a mixed quantitative / qualitative study could also be performed since some of the antecedents require some interpretation of individuals self-perceptions and the effect on their thinking and behavior.

In lieu of more rigorous research, we will use our experience in conducting the advanced facilitation workshop as a first test of our hypotheses and model. Since we did not have this model before we conducted the workshop we were not able to collect all the data we would need to test the hypotheses. Instead, we will use our own reflection of the experience and use what data we were able to collect from the participants to give an initial, albeit insufficient, attempt at validation.

#### ***Advanced Facilitation Workshop Design***

This workshop was designed as follow-on to the High Performance Organization (HPO) Seminar and a basic facilitation skills workshop. This workshop was designed to take a subset of the material (Vision to Performance) of the HPO seminar and combine it with group facilitation processes so that a workshop participant would learn how to facilitate the Vision to Performance process with a group. We hoped to increase understanding of the Vision to Performance theory, increase facilitation skills, and increase participant confidence to apply the Vision to Performance process with a group. We wanted the participants to have enough confidence to do something within their organization after the workshop. This was a five day workshop with 12 participants.

The workshop included two sequences of coaching, planning, practice, reflection for three sub-groups of workshop participants. We created a process of six practice sessions in all.

Each sub-group of four participants was assigned an experienced facilitator as a coach. The coach stayed with the group the entire workshop.

This design enabled the participants to go through the learning cycle twice. We thought that they needed to immediately apply any new learning that they just created from the first cycle. Additionally, the whole experience was relatively new for most members since their normal career was performing technical analysis and development. Therefore we decided that they needed to learn how to learn this type of skills. The second loop through the cycle would give them a second chance at reflecting on how they learned. The top level workshop design is shown below.

#### Day 1

Introductions – Setting the Learning Environment

Feedback Mechanism Explained

Vision to Performance Material Review

Establish Three Facilitator Groups (4 people each) with Coach

Planning for Segment 1 Practices

#### Day 2

Segment 1 Practices (Overview, Vision, Mission Niche)

Planning for Segment 2 Using Feedback from Segment 1 Practices

#### Day 3

Segment 2 Practices (Theory of Business, Strategic Planning, Tactical Planning)

One-On-One Coaching and Individual Skill Development Planning

#### Day 4

Continued One-On-One Coaching

## Sharing Lessons Learned

## Day 5

Planning for the Next FST Facilitation

Building the Facilitator Community

Next Steps and Wrap-Up

***Did Double-Loop Learning Occur?***

We know that some of the attendees of this workshop have continued to grow their facilitation skills and have successfully facilitated groups. We have observed the facilitators in action at subsequent events and have received feedback from other individuals who have said they have witnessed an increased capacity for facilitation skills in these individuals.

In the reflection after the practice sessions we observed participants discovering mismatches in what they thought would occur and what occurred. In this space of open reflection we observed people testing assumptions and developing new theories for use. One manager stated he now understood why as a manager it would not be possible for him to facilitate his own work group. That staying out of the content was too difficult. He assumed prior to his experience in the workshop that he could be a neutral facilitator. In another case an individual expressed frustration at the group's lack of movement to closure when he was facilitating. He recognized that his theory in use was to push harder and become more directive in his behavior which only made the group push back harder. He became aware and tested his own assumption of how to react in that situation. He expressed a willingness to change his action next time and have the group decide if they were ready for closure.

Another participant became aware of an assumption he was holding that a facilitator needs to have all the answers or be more of a teacher, and when he recognized that the facilitator's role was to instead ask the right questions and to guide a process he developed a new theory in use and exhibited a shift from presentation-style to facilitative-style in the subsequent practice sessions.

Several participants began observing from multiple frames of reference – as a facilitator of a group and as a participant of a group, they were able to provide feedback from both perspectives. This is another example of a change in a governing variable of perspective and therefore double-loop learning.

In the next section we evaluate the workshop design from the perspective of the workshop instructor and the workshop participants to see if the conditions for a double-loop learning environment were present.

### ***Social Setting***

The two division managers kicked-off the workshop with a welcome and explanation to the participants of why the workshop was important. My reflective notes include the comment "... not too exciting, probably not a good kick-off, need to get the participants talking more". I was reflecting on the lack of the social setting at the beginning.

The next segment moved us to a relaxed world café style setting (Brown & Isaacs, 2005) with a question that engaged participants in an informal discussion around personal aspirations. This established an environment of discussion and open inquiry. From this segment emerged several relevant issues around being an internal facilitator. This was an example of collaborative inquiry surfacing some common held concerns in the group.

The workshop lasted five contiguous days which allowed people to interact over several days. This was very different from recent training the participants had experienced. Feedback from the participants included comments that reflected a social setting occurred in the workshop.

These included:

- “everyone shared and gave and received feedback”
- “opportunity to meet a lot of people” and “really enjoyed it”
- “had the chance to talk with others”

Participants self-selected into coaching groups and these coaching groups remained intact throughout the five days of the workshop. This allowed for considerable social interaction and informal information exchange.

### *Emotional Space*

Facilitators were getting feedback along with the participants. The expectation of giving and receiving feedback was set early and often in the workshop. We explained feedback guidelines in detail to ensure that feedback was given and received from a productive learning perspective. The workshop ground rules state the value of compassion. Relationships of trust were developed in each of the coaching groups. The participants appeared to “click” with the assigned coaches and we observed energy and engagement in the group sessions.

Feedback from the workshop participants showing evidence of a positive emotional space include:

- “group open” from Day 1 review
- “open discussion” and “more relaxed”
- “giving and receiving feedback was a huge amount of learning for me”
- “environment very nurturing”

- “having coaches as part of practice was beneficial”
- “my goal was trying to be open and relaxed as everything evolved.” “It was rewarding and draining and very satisfying”

After each practice session, the workshop facilitator asked the facilitator-in-training and the participants of the facilitated group “How did that feel for you?”. This was a request for participants to reflect on their emotions. This exposed frustration, happiness, and perhaps anxiety with the experience. We observed that the environment changed to one of open and honest discussion, with assumptions being exposed and more readily tested than before the emotional sharing occurred.

### *Self-Efficacy*

It was clear from participant comments that confidence was built overall and there were ups and downs in perceived capability throughout the workshop. A self assessment form completed towards the end of the workshop caused participants to consciously evaluate their comfort levels with the material. In coaching conversations using the self assessment information some participants choose to continue to build their skills, while others opted out of further skill building. This would imply that efficacy information was present and being evaluated in the workshop. Comments from participants included:

- “helped build my confidence level to the point where I volunteered”
- “I am confident” and “I am curious how others will see us” and “This is doable for me”
- “confidence building having taught those two segments”
- “much more confidence in being able to present”

- “felt overwhelmed the first two days” and “opportunity to practice to feel where my strengths and weaknesses were”
- “not as comfortable with the V to P materials”
- “overwhelming to learn both at the same time”
- “openness and willingness to learn and share”

The practice sessions caused people to stretch and try interventions and processes that might have been risky for them. Some people were obviously more comfortable in the practice setting than others. Some individuals required more encouragement and observing before jumping into the practice sessions. At the beginning of the workshop we asked participants to share what strengths they brought to the workshop. If we had recorded these responses we might have been able to correlate perceived learning self-efficacy with the final performances.

### ***Direct or Observed Experience***

Participants went through several cycles of planning, practicing, observing others practice, and reflecting upon the practice. Comments from the participants clearly show the value of both. Many in the group had also seen one or more of the experienced facilitators in action and commented on the standards set by them. Role playing was used in demonstrate how a contracting session with a client might be handled. Comments from participants included:

- “everyone had a chance to facilitate and practice” and “everyone’s performance”
- “see how tough it is”
- “saw a piece of every one of the objectives met”
- “seeing it is possible I am confident”
- “confidence building having taught those two segments”
- “hands-on experience is the best way to learn”

- “opportunity to practice”
- “observing how you do the planning was very helpful because it is the real thing” and on the other hand “not like the ACME FST”
- “actually getting involved – can’t get that anywhere else”
- “seeing the variety of tools was great – you got to see what worked and didn’t work so well”

### ***Goal Setting***

The opening world café question of “What would becoming a skilled facilitator mean for you?” began the process of surfacing personal goals of the participants. The managers doing the kick-off set an expectation that people from this workshop would apply their skills with a group in the next two weeks. This made the stakes for learning real. Participants that have successfully continued past the workshop appeared to have personal goals for continued learning and development in this domain. Comments from workshop participants that implied goal setting occurred or goals were achieved included:

- “I volunteered”
- “have the real start to self-sufficiency here”
- “I will read the fieldbook next to keep building my skills”
- “have an interest in sharing what we learned and keeping the progress going”
- “one of my goals was to build my coaching skills and I was able to work on that this week”

Out of the workshop, two participants volunteered to apply their skills with the group mentioned by the managers and have continued to do that nine months after the workshop. Two other participants are working with other groups as facilitators. Since this is a collateral duty for

these individuals and not part of their current job function, it appears that personal aspirations are a significant motivator to continued learning.

### **Discussion and Limitation of the Double-Loop Learning Climate Model**

We have some initial concerns with the model that would need to be further examined and tested. First, much of the Action Science literature seems to put a heavy reliance on skilled facilitators to help a group perform double-loop learning. The model does not state anything directly about the affect of the facilitator.

Second, we have focused our examination on social cognitive theory. However, there are many other theories of human learning such as Kolb's experiential learning model, Vygotsky's constructivist learning theory, and Mezirow's transformational learning theory which should inform a model of double-loop learning. Though we did pull in Kolb and Vygotsky in the development of the workshop, we by no means did an exhaustive analysis of their theories in relation to double-loop learning and development of the learning climate model.

Third, organizational barriers to learning were not addressed directly. For example, in our facilitation workshop there was an organizational power differential present since there were supervisors, direct reports and technical team leads in the same workshop. Any issue of power, privilege, and the effects of diversity are not directly included in the model.

Fourth, we have stated the hypothesis in such a way as to indicate some actual action performed, for example reflection on emotion. This would increase the probability that we could develop a method of direct observation of the variables. However, some of the variables may require self-reporting and interpretation that might decrease the validity of the data.

Fifth, the literature discusses many of the concepts we use as interconnected. We have listed them as independent variables. A thorough analysis of variance would have to be conducted to ensure the antecedents are truly independent.

Finally, we assume here a relatively objectivist form of causation. Though this is appealing from a scientific frame of reference, we may be trying to simplify something which is more complex than our model could illuminate. We start by assuming that double-loop learning is a real phenomenon and that we could find a causal model to explain it. This may be in error from the start. Our epistemological frame of reference may not be suited to being helpful in understanding such a complex human endeavor such as double-loop learning.

We will continue to refine our own skills as scholars and practitioners by designing and delivering more workshops to build facilitation skills. From this continued experience we hope to refine and further test the double-loop learning climate model.

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