Training Design for Professional Development

Maud Stehouwer
TNO Defence, Security and Safety
The Netherlands
maud.stehouwer@tno.nl

Commander Jeroen Stricker
Royal Netherlands Navy
The Netherlands
jw.stricker@mindef.nl

LtCdr Wilbert van Gemeren
Royal Netherlands Navy
The Netherlands
hrmsevertsen@navy.dnet.mindef.nl

ABSTRACT

Our complex and fast changing world calls for professional experts. In this paper we address the issue of designing training and instruction to support professional development. A lot of current training does not have this focus and can even be misleading. For example the focus on theory, procedures and system handling can stimulate mindless behavior and easily steer away from conceptual thinking and expertise development. We argue that from operational experience as well as from modern brain and cognitive research, it is easy to understand how some of today's training can be counterproductive from the perspective of professional operational performance. We emphasize that a firm base in conceptual thinking is at the heart of all expertise development and that experience is the driving force of human development.

Implementing modern insights is no trivial matter. A paradigm shift is required. In our view this can only be obtained with a "shared vision on training" and through "bottom up" implementation. We developed a 'job oriented' training philosophy and a basic training concept for training naval personnel of the operational branch. Central in the training concept is operational challenge, discussion and reflection. We explain the concept in view of our experiences and discuss the descriptive models we developed to support training design. Experts and simulation play a crucial role in making the training philosophy work. We conclude that the transition from formal instruction to development and training on the job can be quite natural and smooth in this training philosophy. We discuss how to consolidate the paradigm and how to control the learning process on essentials.

ABOUT THE AUTHORS

Maud Stehouwer is a senior consultant in the field of Command & Control and Simulation at TNO. She is a cognitive psychologist with a background in artificial intelligence. She has 20 years of experience in the field of human performance and training and has been working in research as well as in development of training programs and training tools. She has been working in a wide variety of professional contexts, especially in civil aviation and the military. Characteristic of her approach is a close co-operation with instructors, subject matter experts and technical specialists.

Jeroen Stricker is Commanding Officer of the Netherlands-Belgian Operational School in Den Helder. He has had more than 18 years of sea duty and commanded mine hunters HNLMS Delfzijl and HNLMS Maassluis, and frigates HNLMS Jan van Brakel and HNLMS van Nes. During his career, at sea as well as ashore, he has developed a strong vision on education and training. In his opinion most often the best results in team training are achieved by selecting specific scenarios and stating the training objectives, where after the trainees are to present and demonstrate the various options to achieving the required end state.

Wilbert van Gemeren is a Lieutenant Commander and joined the Royal Netherlands Navy in 1992. He graduated from the Royal Netherlands Naval College in Den Helder in 1997. Subsequently, he performed various jobs in the operational branch on several ships. He was instructor Anti-Air Warfare in several OPSroom simulators at the Belgian-Netherlands Operational School in period 2004-2005. At present he is the Head of Operations (OPSO) on board HNLMS Evertsen, the RNLN newest Air Defence and Command Frigate of the 'De Zeven Provinciën' class.

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INTRODUCTION

I never try to teach my students anything. I only try to create an environment in which they can learn.
Albert Einstein

Our complex and rapidly developing world demands flexibility and adaptability of our experts. To apply our insights on human performance is now more important then ever. However when a fundamental shift of mind is required implementing new ideas is a challenge. People have no difficulty applying new technology in their present paradigm. Changing and applying a new way of thinking is another matter. Last year's IITSEC paper on the issue (Stehouwer et al, 2005), focused on how simulation can be upgraded and used effectively in a job oriented training paradigm, while at the same time it is an important handle to make a paradigm shift happen. In this paper we report on our experiences with paradigm shift from an organizational perspective with a focus on how to design "job oriented" training.

We introduce the urge to change through the dissatisfaction of experts and instructors with current training and student performance. We discuss how modern research and philosophy supports their gut feeling and why we should trade our "knowledge transfer" view of teaching for a developmental perspective on learning. We argue that change is difficult because of current top down controlled organizations and an instructor centered training paradigm. We explain how we approach the paradigm shift, report on our experiences, draw conclusions from results, and discuss further research with the focus on how to consolidate the culture change.

This is a position paper. Our research is qualitative and aims at the implementation of a paradigm shift. We don't pretend to know how human learning works; we just draw practical conclusions for training.

THE GUT FEELING OF EXPERTS

Training Principle Warfare Officers

Vital to the job of a Principle Warfare Officers (PWO) is the assimilation of a fully recognized picture in order to have effective situation awareness. This provides the basis for his two main responsibilities. First, with a strong focus on the Mission, he advices the Captain in fighting his ship. Secondly, he needs to be able to immediately respond in self defense and lead his team to take all necessary action. PWO-training comprises a one year challenging course at the Operational School. Subsequently, it continues on average for a year of on the job training during various operational deployments. We plan a total of two years training to become a professional PWO. Witnessing PWO-students in the various trainers, the majority have difficulty performing their role, seemingly busy in fighting their operational system, procedures, and sometimes even their team. Even when initially provided with an assistant who takes care of these secondary challenges, they have difficulty in performing the essential tasks of their professional role.

Training Chief Petty Officers Air Defense

Chief Petty Officers (CPO) Air Defense enter their career course after many years of operational experience in the Operations Room. Their system and procedural knowledge is therefore of high standard. They face a different challenge than the PWO students. These CPO's experience difficulties with selecting the appropriate set of procedures needed to achieve the aim(s) stated by the PWO. They perform best under a fixed set of rules, whereas present threats and operations often demand a more flexible approach. Successful operations have never been achieved by simply applying a rule book. How to improve on these observations? What is the problem? We realized that telling people how 'things are to be done' does not challenge their intellect nor develop their feeling of responsibility for achieving the result.

DEVELOPING PROFESSIONAL EXPERTS

The gut feeling of the expert is supported by recent research and philosophy on human development and performance. With the concept of the embodied mind (Damasio, 1994; Goldberg, 2001) the significance of experience for learning has become clear. We know that learning involves the entire body, that we are

basically pattern matchers, and that our rational reasoning and urge to act has a firm basis in emotion. To get a feeling of the implications consider the brain damaged son who does recognize his mother, but concludes she is an imposter because his emotion doesn't support what he sees (Ramachandran, 2004).

Concept Development Basic to Expertise

According to Lakoff (1987, 1999), our thinking is based on cognitive models and concepts that we develop in experience. We develop new concepts based on metaphors and the concepts we know already. Because of our embodied mind we can only develop meaningful concepts in experience. Expertise development implies deepening our understanding by developing novel conceptual levels. Our understanding of a situation can be at many levels and can never be expressed all at once. What we consider to be true at a certain time is what determines our sense of urgency and the opportunities we see to handle the situation. To put it practically, a refined conceptual framework, which is inherent to expertise, helps to set our focus and increases our chances of an effective perspective on situations. Whether we feel an urge to act upon a situation depends on the quality of our conceptual network. The more refined our network, the more sophisticated our choices can be. As Howard Gardner put it "An expert is a person who comes to understand the world differently" (2006).

Pattern Matchers and Focus of Attention

Human perception is basically pattern matching (Goldberg, 2005). The brain does not store every detail of a situation for later recollection. It will only store significant aspects and link these to existing conceptual frameworks. What we focus on depends on our individual sense of purpose. In other words how we adjust our cognitive patterns is dependent on what we pay attention to based on what matters to us personally. Of course the process is cyclic. The patterns we recognize in reality are dependent on the conceptual framework we hold at that moment in time. Based on new experiences we adjust our framework (Figure 1). Important principle in how we store and connect is "what fires together wires together". Based on our experiences of success and failure we assess what works and shape our conceptual networks accordingly.

The Power of Mindful Learning

A mindful approach....has three characteristics: the continuous creation of new categories; openness to new information; and an implicit awareness of more than one perspective. Mindlessness in contrast, is characterized by an entrapment in old categories; by automatic behavior that precludes attending to new signals; and by action that operates from a single perspective.

Ellen Langer

The quality of the conceptual network we develop is dependent on the quality of our experiences. People build their own personal logic based on "mindful learning" (Langer, 1998). If we confront our trainees with rigid black and white situations and right and wrong answers, they learn to pay attention to a restricted set of aspects and are pushed to develop into mindless performers. This is how training with a focus on behavior and procedures prevents trainees to build the sophisticated conceptual network of the expert. To be able to develop into mindful professionals trainees need to experience the complexity of the job.

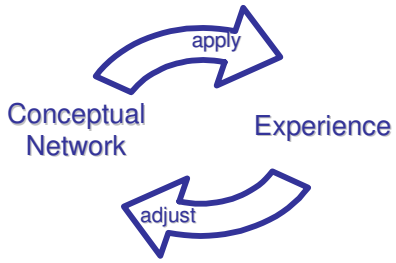

Figure 1. Learning cycle

Accountability is Crucial to Focused Learning

In the context of the discussion on free will in his book "*Neuro-philosophy*" the Dutch psychiatrist den Boer (2003) takes the position that even if we decide there is no such thing as a free will, we still better hold people accountable. He argues that if we would not hold people accountable for their actions, they would not be able to learn. It is accountability that sets our focus of attention. We need to hold trainees accountable for their performance in terms of job responsibility as well as professional development.

Adaptive Decision Making is Essential to Expertise

Our whole educational system is based on teaching veridical decision making.... Strategies of actor centered, adaptive decision making are simply not taught. Instead they are acquired by each individual idiosyncratically, as a personal cognitive discovery, through trials and errors.

E. Gold berg

Goldberg (2001) distinguishes between veridical and adaptive decision making. Veridical decision making is about finding "truth". Adaptive decision making is about obtaining objectives and effective performance. It concerns decisions for which we have to take personal responsibility. In adaptive decision making people primarily involve their frontal lobes, whereas these are hardly active in veridical decision making. Experts are confronted with many ambiguous

situations, and in essence their job is adaptive decision making. However many training programs stress veridical decision making and even seem to keep the responsibility of the job a secret. When we see learning as exercising the brain and shaping conceptual networks, our training programs should accommodate practicing adaptive decision making referenced to the responsibilities of the job. Only then will trainees be able to develop into responsible experts.

People Need a Sense of Urgency to Act

Patterns people recognize in reality are based on their conceptual framework. Our concepts determine what we pay attention to and what meaning we give to a situation. However cognitive meaning is not enough for us to act upon a situation. People with brain damage to the frontal lobes will recognize a situation, but are not able to act upon what they perceive (Damasio, 1994). They cannot perform adaptive decision making because they *feel* no urgency. Only if we feel a sense of urgency we will act upon a situation. In addition this feeling sets the focus for what we will remember from the experience. Our sense of urgency, that is part of the conceptual framework, will only develop in experience and is essential to all expert performance.

Commitment Separates Professional from Layman

Only when committed to a goal and responsibility will we feel a sense of urgency and will we act (Figure 2).

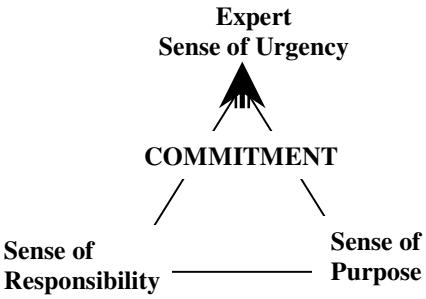

Figure 2. Expert Commitment

We expect our professionals to be committed to a purpose and take responsibility based on their expertise. This commitment is what separates the layman from the professional. To become an expert, dedication and practice time are the major defining factors (Klein, 1998, Ross, 2006). In other words only through commitment can a trainee develop into a professional expert. His commitment should be to the job, and by taking on this responsibility and being held accountable for his personal development will he be able to develop into an expert. Of course commitment implies accountability for own development and of course this is what we expect of any professional.

Mirror Neurons Are a Driving Learning Force

Mirror neurons help us to identify with other people and play a crucial role in learning. They allow us to play in our heads "a sort of "virtual reality" simulation of other people's feelings, actions, and intentions" (Ramachandran, 2004). Watching others triggers and helps build and consolidate our conceptual networks. Whenever we enter new territory we start experimenting and inferring intentions based on what we see others do. We focus on what we personally consider to be important, successful or interesting (Figure 3). The concept of mirror neurons helps us understand why professional experts are essential for developing excellence in our trainees. Furthermore peers play an important role in development as they learn from each others' insights and discoveries. The social character of learning has been stressed by many (Jarvis et al, 2003; Bransford et al, 2000; Senge et al, 2000).

Figure 3. Focus on important others (Dobss, 2006)

IMPLICATIONS FOR TRAINING

Maybe in training we make the mistake to direct our attention to the differences between expert and novice, where *we should focus on the similarities.* When experts are confronted with an entirely unfamiliar problem they behave exactly like novices (Klein, 1998). When no pattern matches people analyze the situation till they feel a sense of urgency. This and the experience as a result of our action are what determine human learning. The difference between novice- and expert thinking seems to originate in the patterns that generate our sense of urgency. People are "built" to construct and adapt these patterns based on the significance they assign to their personal experiences. This is what human learning is about. If we look at current "knowledge transfer" programs from this perspective, a lot of training appears to aim at learning prevention. Instead of using the natural learning power

of people and speed up development, we seem to start our learners off on the wrong foot with veridical knowledge tests and black and white solutions before they had a chance to get any feeling for what they were hired for. Apart from the time lost, expertise development will be slowed down as a result of shallow conceptual networks, counterproductive mindless reflexes, and an incorrect job perception.

Our world is getting more complex everyday. Experts need to make quick decisions in contexts with loads of more or less certain information available, while important information is lacking. The level of expert proficiency required to deal effectively with today's ambiguous situations is high. When we have the ambition to raise professional experts, we should be serious about providing relevant challenges and experience, focus attention on what is important, offer the example of excellent experts and last but not least hold trainees accountable for their own job performance and development. Of course we can only hold people accountable when they are able to make their own choices. One of our major challenges is to find a way to remove control from the instructor.

With modern technology, especially simulation to help provide relevant experience, we have the tools to set necessary conditions. We have the insights and the opportunities to shape our training to the requirements of learning. However, implementation is still no trivial matter.

CHALLENGE OF ORGANISATIONAL CHANGE

Trap of Focus on Control and Knowledge Transfer

The purpose of training is that people learn. It feels like a forgotten target. The focus is on control. Training objectives as a compass to the learner and a way to focus attention seems to have moved out of sight. An instructor-centered approach and "knowledge transfer" view on learning are not working (Jarvis et al, 2003). With criteria that focus on what is easy to measure "objectively" instead of *making measurable what is important*, we create an illusion of control. In the process we seem to have lost our *respect for expertise*. The challenge is to start controlling what matters and make room for expertise again.

Trap of Focus on Top Down Implementation

Organizations that believe in top down management tend to translate all perceived need to change "mindlessly" in top down controlled "reorganization." Management and staff prescribe what needs to be done and employees expect to be controlled and told "exactly" what to do. It is a pattern we subconsciously and mindlessly apply, and in which everybody knows his "role". Because it is familiar it may feel safe, but it stands in the way of fundamental change and professional development. The challenge is to break the pattern and set off a paradigm shift. Respect for expertise and using the natural learning power of people are the key factors here.

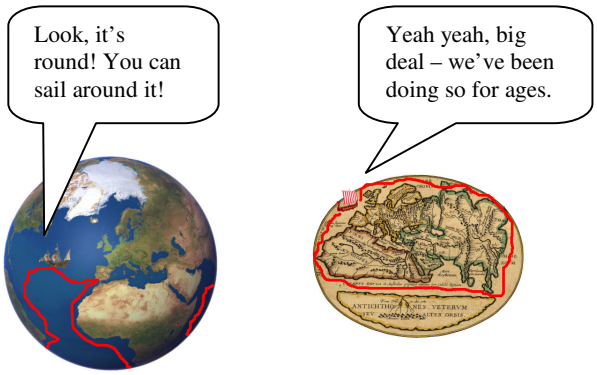

Figure 4.
Paradigm shift implies reconceptualization

CONTROL WHAT REALLY MATTERS

Shared Vision

We defined an explicit training philosophy that embraces recent insights about learning and makes explicit how we believe that human performance and human learning works. The philosophy serves as a touch stone for everything we do in training and provides the shared vision that is essential to organizational change (Senge, 1990, Robbins & Finley, 1997). A training philosophy is not about a piece of paper, but about a *shared vision that everyone involved needs to develop for himself in experience*.

Bottom up Development

As Kuhn saw, the history of science yields cases of scientific revolutions. For us, these are cases in which new metaphors replace old ones, in which the new metaphor is incommensurable with the old metaphor, and hence an entire discipline is reconceptualized.

Lakoff and Johnson

To bring about fundamental change in thinking, people need to experience essentials. Only in practice will new concepts evolve and will we "re-conceptualize" (figure 4). The vision of management will be no more than a vision as long as no practical example has materialized. Only in the operation can we deepen our understanding. Everybody needs to develop their own concepts from their own perspective in their own

experience. In other words, the only road to fundamental change is "just start doing it" with an open and mindful attitude. Fundamental change will start with a vision, preferably supported by management, but can only be implemented bottom up. If we work with a vision that is being effectuated in the operation, we will at the same time be able to develop our shared vision further and make possible what no one imagined beforehand (Stehouwer et al, 2005). It is of course essential to start this bottom up development with people that, implicitly, have a compatible vision on learning and that are interested in experimenting with new ideas.

JOB ORIENTED TRAINING PHILOSOPHY

The uncompromising commitment to be technically and tactically competent; to achieve and exceed demanding standards; to be combat ready.
Excerpt from The Warrior Ethos

Our training programs aim to raise professional experts that are committed to their job. We know that people need challenge and experience to develop relevant concepts, expert situation assessment, and adaptive decision making. Most importantly, we have to set clear standards and hold trainees accountable for their development and performance on the job. If we arrange our training environments accordingly, we give a learner the opportunity to develop an integrated sense of purpose, sense of responsibility and sense of urgency (Figure 5). Only then can trainees internalize expert standards and develop into *committed professionals* that grow quickly in the job more or less autonomously.

Figure 5. Requirements on training environment

We summarize our philosophy in some practical essentials:

- Focus on the responsibility of the job
- Provide challenges in a realistic task environment
- Set demands in terms of proficiency standards
- Stimulate and support discussion and reflection
- Learner is accountable for own development
- Expert is crucial to focus attention

To stress that the focus should always be on the purpose and responsibility of the job, the label we chose is Job Oriented Training (JOT).

CURRICULUM DESIGN

Our first step when designing a curriculum is to try and understand the logic of the job in terms of human performance and how people "naturally" develop the required expertise. Based on our understanding we set up a curriculum in terms of meaningful challenges.

The simplest way to realize this is to take a "good learner," see what challenges he likes, and watch him develop. An expert supports the process by helping to define the challenges and setting the standard. A less talented learner can profit a lot from this predefined structure.

Perhaps a more pragmatic way we used is for experienced expert instructor(s) to think up a logical chain of challenges. This curriculum is used in a try out for a real course. During the course they will adapt the curriculum in conference with students and based on these experiences will redesign the chain.

Chain of Meaningful Challenges

A JOT curriculum gives trainees the opportunity to face meaningful challenges in a relevant reality from day one.

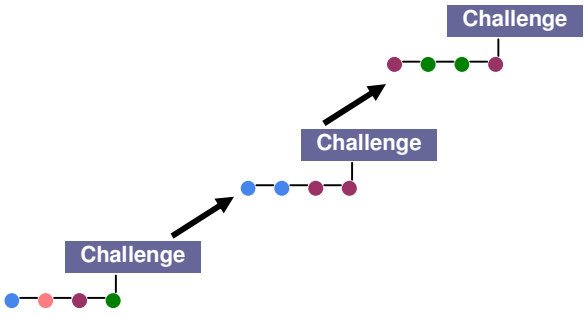

Figure 6. Growing in the Job

While attaining a meaningful objective trainees develop essential concepts (represented by the colored circles in Figure 6) and grow in their job. Each exercise addresses the responsibility of the job and suits the trainee's development level. The further we are in the course the closer the challenges are to the essential responsibility.

Model for Analysis of Expert Performance
In expert performance we distinguish between Assess, Decide and Perform tasks (Figure 7). Often in task analysis we identify Assess tasks. Assessment is at the heart of expert performance. A proficient expert will feel an immediate sense of urgency where a semi expert needs to analyze and will react more slowly (Klein, 1998). Compared to Perform and Decide tasks, Assess tasks take longer to develop to an expert proficiency level and are, because of their subconscious nature, above all dependent on the quantity and quality of experiences. Making Assess tasks explicit provides a basis for holding trainees accountable for developing assessment skills.

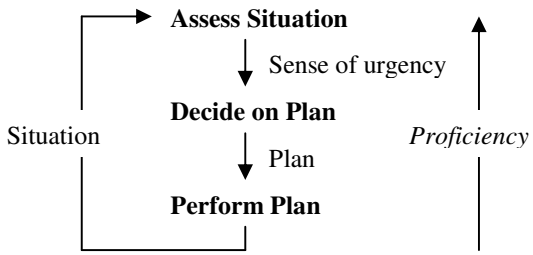

Figure 7. Model of Human Performance

Expertise Development Model to Focus Attention
Based on our experience and understanding of human expertise, we define a basic logic to focus attention during training. We distinguish five conceptual levels:

Levels of sense of purpose & responsibility

- *Logic of the job*: Trainees have a mental model of the job and understand the purpose and essences of the work they are hired for.
- *Responsibility and cooperation*: Trainees understand their role and those of others, the added value of their expertise and that of others and know how the team is supposed to coordinate.

Face reality level (sense of urgency)

- Trainees know how to fulfill their responsibility and perform effectively in the reality of the job

Levels of integration in organization

- Trainees know how to operate the *systems* that are used in the job.
- Trainees work efficiently and according to the *routines and procedures* of the organization.

Focus of Attention Moves Inside Out
To support a natural, integrated and mindful expert development, we focus on the sense of purpose and responsibility first. Next, when trainees are able to face reality based on their own thinking, the heart of expertise is starting to develop. Only after trainees developed basic concepts related to reality will we direct attention to the organization levels. If we demand proficiency at this level at an earlier stage of development, we risk raising mindless semi experts.

Proficiency Development Moves Outside In
Clearly these are not discrete levels. We need to perform to be able to understand and we need to understand for good performance. In performance we develop all levels simultaneously and connect them in our conceptual framework. When we mastered the first three levels, we have become experts (orange in figure 8). In the process we can also proficiently act in the organization we trained for, but will also be able to integrate quickly in any organization. The model shows that we do not at any price need the "real" system for basic expertise development. For complex tasks expertise development is an ever on-going cycle of deepening our understanding especially at the logic of the job, responsibility, and reality level.

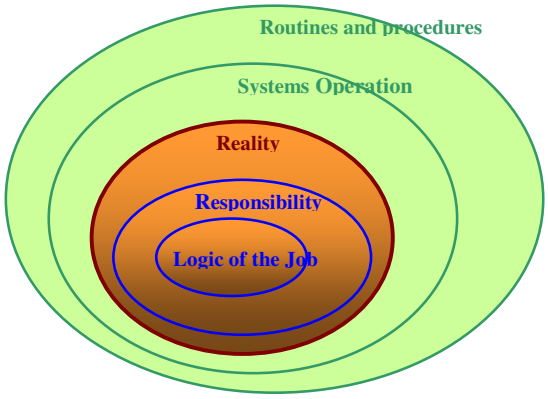

Figure 8. Expertise Development Model

EXPERIMENT & GAME TRAINING CONCEPT

To give an impression of what JOT looks like in practice, we briefly describe a sample training concept we used for CPO trainees. Every week they focus on a new operational assignment and follow the training cycles of "Plan & Discuss" and "Practice & Reflect."

Plan & Discuss
In syndicates of two or three, trainees plan and discuss the assignment among themselves. Next, plans are presented and discussed on the "tactical floor" (figure 9). Most of the time trainees work independently using their own common sense. The discussion among peers provides a chance to investigate thoroughly and develop a strong understanding of the assignment in all its details. They think through the issues like experts do if they come across an unfamiliar problem (Klein, 1998). Trainees learn to appreciate and develop this

expert habit, while at the same time their concept development gets a boost. Probably we just put them on the track of natural learning and perhaps we should consider professionalism to be a natural human attitude. Only at the end of a cycle (table 1) will trainees get an "*expert's perspective*" when the instructor gives his view on the assignment.

	Learners	Instructor
Assignment (8-12 hours)	In syndicates, experiment and define solutions	Supports when asked, without giving solutions.
Discussion (4 hours)	Present, demonstrate and discuss observations and solutions on tactical floor	Just listens!!
Expert feedback (15-30 min.)	Reply to expert questions	Focuses by asking expert questions about solution
Final plan (1 hour)	Define a definite plan all together, present and adjust if desired	Expert perspective on assignment (not on solutions)

Table 1. Example of plan & discuss cycle

Practice & Reflect

Once trainees have thought through the assignment and feel they can control the challenge, they start gaming. In the "gaming environment" they face "reality". Time is the major factor to handle. Now they get a feeling for the dynamics of the job and a chance to practice adaptive decision making and develop an expert sense of urgency. Because they did think through the problem thoroughly beforehand they are able to perform and experience on a higher level of expertise than you might expect based on proficiency. This can speed up the process of concept development substantially.

Only after trainees evaluated their own gaming performance will the expert give his observations and view on trainees' performance. By this time the trainees have developed their own perspective and can reflect meaningfully on the expert's perceptions. The power of the approach is to force trainees into expert behavior of "*deliberate practice and reflection*" and "*effortful study*" that is essential to gain an adequate level of proficiency (Klein, 1998, Ross, 2006).

ROLE OF INSTRUCTOR

In the JOT philosophy with a previously designed curriculum, the added value of the instructor is that of *expert on the job*. His role in training is very similar to his role as a commander or team leader. His relation with trainees should be one of mutual respect in which he treats trainees like "professional experts on unknown territory." The primary responsibility of the instructor is to focus attention on what is important and hold trainees accountable. Here he has two main tasks:

- To set an expert example. Especially the way of thinking and the professional attitude are communicated implicitly and copied by trainees.
- To guard the standards. The instructor ensures that trainees who pass the tests actually meet the proficiency criteria set by the organization. We expect trainees not only to develop the expert concepts and sense of urgency, but also the attitude of mindfulness & accountability.

The secondary responsibility is to support and coach trainees in their development. To prevent confusion about accountability, in principle the initiative should be with trainees.

Figure 9. Tactical floor

ROLE OF SIMULATION

Simulation plays a crucial role in making the JOT philosophy work. It makes it feasible for trainees to experience and face challenges of the job where before this was often impossible, laborious or expensive. The freedom simulation allows can speed up learning substantially.

INSTRUCTOR EXPERIENCES

We did two try outs. The first was Maritime Command and Control Information System (MCCIS) practical training course for future Corporals. The second was the basic course Anti Air Warfare (AAW) theory for CPO's which was only partly redesigned according to the JOT Philosophy into "tactical decision making". Before, both were traditional courses with PowerPoint® and lecturing and little focus on the job responsibilities.

MCCIS Course for Future Corporals

Our initial try out was with the MCCIS practical course. Based on predefined challenges students explored the system by themselves. We stopped telling

them what to do next. We listened, bounced their problems back to them, and discussed, and, of course, sometimes they were in need of an expert's answer. But most of the time they acquired all knowledge purely by themselves. Of course, on many instances the military profession requires that sailors execute a predefined drill, to get things done correctly and safely. Do not teach students the drill! Let them experiment, have them explore the way around these drills so that they see what goes wrong when they do not stick to the drill. We observed not only a change in attitude (responsibility) of the students but also better results. We were able to send a new bunch of sailors afloat who not only understood their drills, but also were able to apply these in different scenarios. Eventually we also expect to be able to reduce the duration of the MCCIS course substantially.

Inspired by the first success, we moved on to implementing the new recipe in the Air Defense course for CPO's. We were in for a bigger challenge here. Students of the MCISS course were young, inexperienced, and open minded. With the CPO's we had a target population that had strong views based on their working and traditional instruction experiences. As it turned out, we did not need to worry.

Training CPO's

"The students understood the new approach very rapidly, they took their responsibility and we - as trainers - were not always up to their challenging eagerness for more. Having been trained under a rigid disciplinary regime ourselves, we sometimes lacked the expertise, flexibility and confidence to counter the out of the box ideas and solutions presented by the students. Suddenly we were no longer the experts - the "knowing things better" staff - but fellow students!

In the course we came across some practical issues with our simulation tools. In the JOT concept we need the flexibility to import scenarios and student plans into the tactical trainers, where before we were restricting ourselves to staff recipes. At present we have overcome a lot of these initial challenges and are confident that for future courses we can make better use of our tools. We feel we set an important step in implementing the new training philosophy. Now we facilitate the learning process, instead of training human machinery."

LESSONS LEARNED

Curriculum

For both courses we set up a chain of challenges that focuses on the responsibility of the job and in both simulation plays a central role. It quickly became clear that students can do much more than we assessed in advance. Starting assignments were too easy in both curricula. As underestimation is a major threat to development (Bransford et all, 2000, Jarvis et al, 2003), this issue needs serious consideration. Where possible we adapted the lesson plan during the course and by the end of the try outs the requirements on the curricula were pretty clear. Lecturing is estimated to be brought back to 10% of the time and has now primarily the character of the instructor expressing expert opinions in the context of the assignment. The urge to find veridical information comes up naturally when trainees are faced with challenges and is covered largely during the "plan & discuss cycle". During reflection instructors might elaborate on these issues.

To accommodate inexperienced instructors we can list the topics that come up with each challenge. However we should beware they won't trigger to start lecturing.

Training Process

An important argument for using JOT is that it feels natural, and students as well as instructors report it to be more pleasant. Where in the traditional paradigm, students are quite passive, now the energy is where it should be, with the students. Students are active, interested, and committed. There is no need to keep all trainees at the same "knowledge level", so during the course good students get the opportunity to develop sky high. Collateral advantage is that good trainees are excellent coaches for their slower peers. Most importantly, all trainees do have a feeling of competence at the end of the course.

The workload for the instructor is significantly less and focused on what matters in a natural learning process. We expect that with experience the workload will diminish further. The ambition to use our best experts for instruction, which from a learning perspective is essential, will become feasible.

Instructors

People "re-conceptualize" all the time, mostly without paying attention. Often afterwards we cannot imagine we once thought differently. Still for those who have never experienced consciously changing mindless habits, it is hard to imagine how difficult this can be. Even when mentally convinced, you lack the repertoire, confidence or trust to implement new ways. Old reflexes keep interfering. The main challenge for instructors is to prevent rushing into "teaching mode". In this context the traditional expectations and inclination of some trainees to focus on what the instructor wants can be hard to deal with. Although

there are big differences between instructors, they all had their struggle. The tendency to think in terms of knowledge to be transferred and "tick off" training objectives seems especially hard to control.

More generally, it is difficult for instructors to set focus on the operational challenge instead of knowledge, leave responsibility with trainees, and find a balance between "structure" and "freedom." The current firm mindset that the instructor is leading is not easily changed. How to cope with trainees that, within clear margins, manage their own learning process has to shape in experience. It takes time to re-conceptualize for both instructors and trainees. Of course with the future "gaming generation" this might well be a non-issue soon (Prensky, 2001, 2002, Hartman et al, 2005). They for the greater part hold the concepts and don't need to re-conceptualize.

Trainees
Trainees made the shift a lot easier and did what we expect of active learners. Once they were committed to a challenge they were involved and took responsibility easily. They liked the way of working, took on the professional attitude easily and knew how to deal with the new approach quickly.

For the CPO course, that was only changed partly and where knowledge transfer and instructor-centered instruction were still a large part of the training, trainee evaluations were not entirely positive. Remarkably, in their comments they pin pointed precisely where instructors had had trouble making the shift, demonstrating that learners understand the JOT philosophy intuitively.

RESULTS

New Paradigm requires New Measurement Concept
Drawing definite conclusions about results is difficult at this stage. Every paradigm holds its own measurement concepts (Kuhn, 1962). The currently used "objective" tests, with focus on veridical knowledge, cannot differentiate on essentials. All expert instructors know the feeling of having doubts about a student with satisfactory results on official tests. The real profit of applying JOT is expected to be that trainees develop better on the job. The challenge of *making measurable what is important* has yet to be faced. In the mean time we draw some tentative conclusions about our results.

Traditional Test Results
Our students were tested using traditional tests and the results give reason to be cautiously optimistic. On both try outs, students scored well, but as the instructors noted "this was a good group." They must be right of course, as most people are good learners and bringing out the learning power is exactly what JOT aims at.

Trainee Performance on Challenges
During the course trainees were evaluated according to previously set standards. If there were problems these were diagnosed and handled immediately. Instructors kept track of whether students develop as expected. More importantly trainees could easily keep track for themselves and, consciously or subconsciously, set their personal developmental objectives. This natural feedback process might well be one of the key factors of why we had mostly good learners.

Professional Attitude
At the end of the course the commitment to do the job and professional attitude should be the driving force for further development. To draw conclusions in this respect we need to look for signals that trainees show expert behavior. Do they evaluate their own performance, ask themselves "expert questions" and did they internalize a "*deliberate practice and reflection*" attitude. How subtle these indications can be is illustrated by an observation during the MCISS test when students surprised the instructors by actually using the system to check whether their messages were sent correctly. The instructors had never seen students do that before during a test.

DISCUSSION AND FURTHER RESEARCH

Measuring what is important
In our view what matters is that trainees develop a "high quality and effective conceptual network" and a "professional attitude". These are linked firmly and together they form the guarantee that trainees can and will develop on the job to a higher level of proficiency faster and more easily. To "prove" the added value of the approach we need new measurement concepts. Our current research focuses on developing measurement instruments based on the Behaviorally Anchored Rating Scale for tactical thinking (T-BARS) of Klein Associates (Phillips et al, 2005). T-BARS is a system that relies on expert assessment instead of "objective" measurement. Of course effective performance should always be central in the assessment.

Training on the Job
An important argument to start the training philosophy discussion is the aspiration to professionalize training on the job and develop tools for training on board. As with the JOT philosophy the gap between training and operation is significantly smaller, we expect the ambition for operational personnel to be able to largely develop autonomously on board to be a feasible target.

Proficiency Control
Performance appraisal serves two purposes. First, as trainees are responsible for their own development it is essential that trainees assess their own proficiency. Of course any professional should be able to assess his own work. Second, instructors determine if trainees meet the proficiency standards of the organization. Of course the check should be on essentials.

Currently we are developing an assessment system and supporting tool that can be used in the school as well as on the job. The system aims to support autonomous reflection on performance. The instructor or operational manager can use the system as a proficiency control tool. Further we expect to check whether trainees have the professional attitude to develop further more or less autonomously by defining criteria for a professional and expert attitude. Again we expect T-BARS to help set a first step.

Paradigm Shift
Paradigm shift, re-conceptualization or culture change, whatever you call it, management needs to accept its chaotic nature and be able to just focus on steps that are moving into the desired direction. Looking for "perfection" is destined to be ineffective. We know there are many pitfalls we cannot always avoid and that everyone has to walk their personal "reconceptualization" path. Development calls for exploring borders, which implies that things sometimes go wrong. Working on our shared vision, looking for good opportunities and learning from our experiences provide the key to fast culture change. We made a first important step. There are now two operational examples. Both have their own value for further implementation. Based on the examples, other instructors find the inspiration to adapt their courses.

An important handle we plan to use is the fact that instructors move on quickly. In our approach inexperienced instructors that are experts on the job and have leadership experience intuitively understand the training philosophy once they realize what human development implies. A short introduction should put them in their primary instructor role as an expert that communicates the professional standard by showing the example and treating trainees as professionals. Advantage of the approach is that a culture of professional cooperation will develop and naturally extrapolate to the job environment. Other benefits are that instruction becomes a valuable experience for leadership development and that new instructors only need a short introduction.

Finally we stress that shifting this paradigm might soon be a non issue considering future generations seem to develop the attitude of mindfulness and adaptive decision making naturally (Prensky, 2001). They seem to have no problem dealing with large amounts of uncertain information in ambiguous situations while making fast decisions. This seems to be mostly the result of their "unguided" experience with modern technology, games and internet. Could we ask for a better demonstration of the training philosophy?

Technology as a handle for paradigm shift
"Technology is only technology if it was invented after you were born."
Alan Kay

From a developmental perspective, technology sets our young generation free from counterproductive restrictions and sets the conditions for them to use their learning power to naturally grow a "professional" attitude. It is a demonstration of how technology can set off a culture change. We stress two ways of how we can use technology to support the paradigm shift. First, although by now everybody realizes the power of simulation, we feel we are still discovering the opportunities for our training programs. Especially the added value of simulation as a tool for experimentation and mental simulation seems to be underestimated. We are currently focusing on integrating simulation as a driver for "discussion and reflection" in tactical training. Again, if we look at our youngsters, it seems like nothing new. We only have to incorporate the concept in our training programs and trainees will use it naturally.

Secondly technology provides a handle to help us control the learning process and break with mindless "behaviorist" habits. The tool we are developing to support the assessment system might be an example of an important lever. As it gives trainees the opportunity to evaluate their own performance it helps put the responsibility where it belongs. Further it can help set focus on essentials and prevent instructors from falling back into instructor centered routines. It might also provide the basis for a system that gives management the opportunity to check proficiency on essentials.

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