International Journal of Business, Human and Social Sciences
ISSN: 2517-9411
Vol:2, No:11, 2008

# Learning through Shared Procedures -A Case of using Technology to Bridge the Gap between Theory and Practice in Officer Education

O. Boe, S-T. Kristiansen, and R. Wold

***Abstract*—**In this article we explore how computer assisted exercises may allow for bridging the traditional gap between theory and practice in professional education. To educate officers able to master the complexity of the battlefield the Norwegian Military Academy needs to develop a learning environment that allows for creating viable connections between the educational environment and the field of practice. In response to this challenge we explore the conditions necessary to make computer assisted training systems (CATS) a useful tool to create structural similarities between an educational context and the field of military practice. Although, CATS may facilitate work procedures close to real life situations, this case do demonstrate how professional competence also must build on viable learning theories and environments. This paper explores the conditions that allow for using simulators to facilitate professional competence from within an educational setting. We develop a generic didactic model that ascribes learning to participation in iterative cycles of action and reflection. The development of this model is motivated by the need to develop an interdisciplinary professional education rooted in the pattern of military practice.

***Keywords*—**Development in higher education, experiential learning, professional education, simulation.

## I. Introduction

THE Norwegian army is presently engaged in operations in Afghanistan. The range of missions is increasing and this makes new demands on those working in the armed forces. The global war on terror and battlefields characterised by "four block war" have increased the need for a comprehensive education that graduates officers with knowledge and skills that transcend military tactics and planning, as such. Hence, to graduate officers mastering the changing context of operations has made it necessary for the Norwegian Military Academy (NMA) to create an educational setting that reproduces work activities and subjects with definite reference to the patterns inherent in military practices. A separation between theories and practice not only makes it difficult to recognize theories usefulness in solving practical problems [1], indeed, it limits the learners' access to new perspectives on practice. Bridging the gap between theory and practice in higher education requires interactive work processes that accomplish successive cycles of action and reflection [2]. We argue this calls for a learning environment in which concept development and work processes merge in relation to cadets' activities of solving real life problems.

This perspective on learning and knowledge as outcomes of shared procedures differs fundamentally from the metaphor of learning as acquisition [3]–[5]. This perspective requires that we explore CATS as a tool that cultivates interactive processes of "joint learning by doing" [6]–[8]. The interactive approach to learning takes form in the confrontation with a concrete problem, in which the solution requires reflection [3], [9], [2]. Reflection is not an end in itself, but a way to make the learners ready for a joint enterprise [10]. Reflections on the observed consequences of joint action form the ground to which new knowledge structures may attach. Applying CATS not only allows for facilitating procedural skills, but of equal importance, it produces applicable knowledge by its ability to undertake different theories integral to work procedures close to real life situations. Thus, the key to success in bridging theories and practice in professional education is found in a context mirroring real world procedures and which allow for choosing and applying the right tool to a particular scenario. We therefore suggest that CATS allows for installing an action-oriented context to knowledge production and teaching that reflect the pattern of military practice. In other words, the emphasise we place on "learning by doing" in combination with CATS may challenge and alter the way we traditionally perceive knowledge and learning in institutions providing higher education. Thus, we chose to perceive CATS a tool that allows for building an educational context where the participants' understanding and perceptions are tuned as procedures are developed and refined according to the problem at hand. Therefore, to understand and utilize the potential of incorporating CATS in an educational context

Manuscript submitted May 30, 2008. This work was supported by the Norwegian Military Academy.

O. Boe is Associate Professor of leadership at the Department of leadership and ethics at the Norwegian Military Academy (e-mail: olboe@mil.no).

S-T. Kristiansen is a researcher at the Department of leadership and ethics at the Norwegian Military Academy (e-mail: svkristiansen@mil.no).

Major R. Wold works as a senior instructor in tactics and military decision planning at the Department of Military Studies at the Norwegian Military Academy (e-mail: rwold@mil.no).

requires a perspective on technology as a tool for facilitating shared procedures and learning as participation in social practice [7].

The advances in the computer assisted training systems (CATS), has made it possible to replace live fire exercises with simulators as a medium for training and instructions. Compared to traditional military exercises with and without troops, CATS allow for rewinding the process, repeating it and assessing the outcomes due to different approaches to the task. The students can perform an identical manoeuvre, receive feedback, adjust action and observe the consequences numerous times. Using CATS allows for completing series cycles of action and reflection within a limited timeframe due to its ability to reduce or completely remove the time gap between decisions and feedback on effects. Simulators may compose a significant educational tool in their ability to provide learners with close to realistic scenarios from which to gain experience. These scenarios allow for creating contextual similarities between the educational context where knowledge is catered, and the context of practice where the bodies of theories are applied. This also relates to the simulators ability to provide situations that permit for work processes, organizing roles and applying tools parallel to the way these dimensions of work operate in military practice. CATS ability to create scenarios and work processes close to practice render it as an important mean for inducing student driven experiments and for building classroom communities similar to the organization of knowledge-producing expert communities in the armed forces [11]. However, if computer-aided training is going to have the desired effect on students' development and learning, it is imperative not only to maximize the numbers of scenarios presented, but to ensure quality by emphasizing learning episodes reflecting significant patterns of military practice. Therefore, insight into factors that determines the quality of this training is indispensable in order to design a practice based learning environment in an educational setting.

It is widely held that a main advantage of using CATS relates to its capacity to create a context for applying and sharing knowledge in relation to a particular problematic situation. However, major identified problems link to simulators not fully support the following important features of a practice based learning environment have been identified. These include interactive learning processes, performance evaluation close to action, and group management [12].

It is also questionable how to make CATS cultivate an interdisciplinary approach to competence development and change. However, these identified challenges of using CATS require that we investigate how to optimise the interplay between the technological and learning as social practice in professional education [13]. However, there are few guidelines outlining key characteristics of a learning process that could facilitate practice based learning in relation to the use of simulators. The purpose of the paper is therefore to develop a generic didactic model for simulator-based training in professional education. This model may provide the basis for specifying training programme requirements, identifying instructor competence requirements and requisite procedures for linking subjects to students' problem solving activities.

This paper reports preliminary results from a project initiated by the NMA, with the purpose to explore simulator based training as a mean to facilitate interdisciplinary activities anchored in operational scenarios. The paper is in part based on interviews with cadets and faculty members at the NMA. The paper builds in particular on participative observations and facilitation of a student group during a one week simulated planning and battle field exercise.

## II. The Challenge of Bridging Theory and Practice

Without its contextual thickness and subdivided into distinct fields, theories divide from practical use and thereby cease to provide social meanings. Although educational institutions should nurture students' will and ability to learn from practice, the consequence of separating theories and practice is an epistemology that fosters selective inattention to practical competence and professional mastery [2]. This epistemological debate, which addresses the relation between theory and practice, has been an issue of major concern throughout the history of the NMA as well.

There are two distinct concepts of knowledge. We can distinguish between knowledge within the act of doing that transpires in direct engagement with a certain reality and, knowledge defined in the Cartesian way, which ascribes to aspects of this reality [14]. Accordingly, knowledge is both something embedded in practice, and something that allows for conceptualising aspects about this practice. Contrary to theories, knowledge produced in action ascribes to the learners' engagement in procedures that allow for enacting upon the conditions they face in order to change them. However, practitioners' ability for deliberative action is also an outcome of their competence to analyse and conceptualise various aspects of the situations they encounter. For example, officers' ability to analyse different aspects of complex situation is fundamental to their ability to gain legitimacy in the "fog of war". To enhance cadets' skills in conceptualising practice requires a learning environment that allows for taking theories integral to procedures of solving practical problems. This approach corresponds to Burke's definition of a profession as: *a relatively "high status" occupation whose members apply abstract knowledge to solve problems in a particular field of endeavour* [15]. For in depth discussions of professions see Abbot [16] or Freidson [17].

Although theories enable professionals to perceive and conceptualise concrete situations in new ways, they are, however, not superior to practice, but should rather be perceived as complementary to knowledge developed in action [18]. In a context providing professional training, this entails a perspective on theories as something that should transpire from and operate integral to practical situations [19]. However, a departmentalised task structure has traditional formed a major obstacle to obtain the goal of bridge theories and practice in educational organizations [1].

## III. The Task Structure of Higher Education

The predominant way of perceiving and structuring the educational task determines the characteristics of an educational organization [13]. The structure of the subjects taught and their interdependencies, in combination with criteria established for evaluation, determine the type of relationship that is possible among the faculty members, between students and faculty, and between the subjects and students. This perspective on educational organizations in terms of processes and tasks carried out by the members converges with Karl Weick's notion that if you look for an organization you will never find it [20]. What you may find are numerous events, time schedules, activities and processes more or less linked to each other. Indeed, these numerous activities together constitute a complex organizational environment of interdependent relationships between tasks and the employees allocated to carry them out. To bridge theory and practice in higher education is difficult unless we account for this complex web of interdependencies and the context in which they are embedded. External actors' attempts to impose changes in educational institutions tend to fail due to their insensitivity to the rhythm of the local context and their neglecting the historical patterns of practice among the faculty [21]. Therefore, involving teachers in activities of developing educational tasks allowing for students and faculty to learn from what they accomplish together may provide a viable approach to educational change. In this case, the teachers explore CATS as a tool both for approaching an interdisciplinary approach to learning and for strengthening the linkages between theory and practice at the NMA.

In a bureaucracy, each task is subdivided and allocated to one person, who is responsible for a piece as it was an independent element [22]. This particular model of structuring the task makes it difficult for employees on lower levels to see how his / her work connects to different and overall tasks. The fine-grained task structure not only ascribes to bureaucracies, it certainly represents a prominent way of organizing teaching and subjects in higher education as well [1]. For example, leadership education is traditionally a theme subdivided into different courses like organizational change, trait theories, communication, coaching, conveying different aims and means. This fragmented task structure separates the faculty, which accordingly provides education in particular detached fields. Hence, the curriculum rooted in university disciplines composes a major obstacle to realizing interdisciplinary work and creating change in higher education from within the rhythm of teachers' practice [23], [1], [24].

## IV. The Norwegian Military Academy

The NMA was established in 1750 as the first academic institution in Norway and among the oldest military academies in the world. The NMA has since its foundation been located in Oslo. The primary task has always been to educate and train Norwegian Army Officers capable of training, deploying and commanding own troops in any area of operations and by use of direct leadership being able to solve missions in combined, joint settings. The major purpose of the NMA is to educate officers holding the knowledge, skills and attitudes that qualify them for service on platoon and company level in war, crisis and peace. The education is of three years duration and qualifies as a bachelor in military studies. There are at present 210 cadets in 3 programmes and approximately 130 military and civilian employees. The annual budget is approximately. 23 mill Euro.

The NMA has organized the education within the departments of military studies, international studies and leadership. Fig. 1 displays how the subjects are organized.

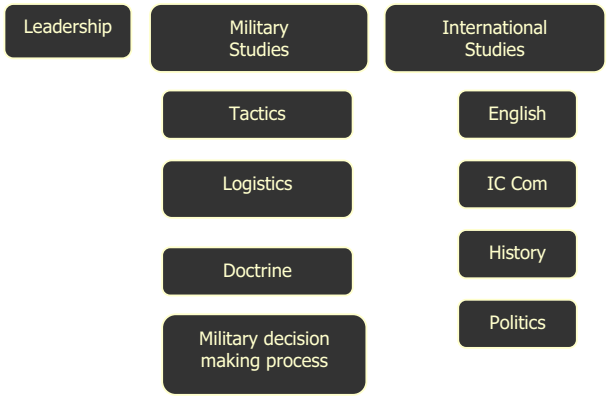


Fig. 1 The organization of the subjects taught at the NMA

Fig. 1 illustrates the organization of the subjects taught at the NMA. This way of organizing the subjects resembles a "departmental" structure, where each subject can be taught without any particular references to the others. Although there is much informal cooperation and mutual support among the teachers at the NMA, the departmentalized task structure has also caused a pedagogical distance between faculties. This tension is for example noticeable between those teaching tactics, which are mainly officers recruited from battle units, and those teaching different leadership subjects. On the one hand, the officers teaching tactics have perceived the leadership education as decoupled from occupational tasks, while on the other hand, those teaching subjects of leadership have regarded the teaching in tactics as based on an expert – novice approach to learning and development. The distinct point of departure between those believing in the need to socialise the newcomers into the standards of the profession versus those conveying the need to make these standards subjects to critical inquiries has made it difficult to explore a multidisciplinary approach that connects subjects of leadership and tactics to shared educational tasks [25].

Another consequence of this particular association between the subjects is their competitive relationships. During a crisis, when the time schedule breaks down or when it comes to calculation of points it has been necessary to downgrade some subjects and upgrade others. It is likely that an interdisciplinary task structure create positive interdependencies among the faculties. A shared collaborative ground provides opportunities for solving sporadic local "catastrophes or conflicts through dialogues that transcend

boundaries confining different work communities. The NMA has issued several initiatives to explore a more comprehensive approach to the organization of the subjects. These initiatives include a project of making problem-based learning a major pedagogical approach, interdisciplinary field exercises, and a project of planning the deployment of a battalion to Afghanistan. The exploration of CATS as a mean to undertake an interdisciplinary approach integral to practical situations is another initiative along the same path. In the following, we outline a simulated battle exercise and discuss the challenges of carrying out an interdisciplinary approach integral to military work procedures.

## V. A Simulated Battle Exercise

In 2000 the NMA invested in simulator facilities. The main part of the software program consists of a simulator system (GESI) produced and delivered by a German company, CAE Electronic GmbH [26]. The system is designed for training at division and brigade level, but the NMA used it for training at battalion and company level. The simulator (TT) is run as a classroom setup with 22 work stations for the players and 1 work station for the instructors. The screens display the complexity of a greater operation, not only by representing the manoeuvre elements (for instance tanks), but also medical support, technical support and reinforcement supplies as well.

## VI. The Organizing Principles

The training session from which this report derives is based on a scenario in which the assigned task is to delay an attacking enemy. The group of 40 cadets was split into four subgroups each composing three platoon leaders, one company commander, artillery officer, logistics officer, engineering officer, second in command, and an intelligence officer. The composition of this group was analogous to the combined arms team, which denotes a task unit in which various battle elements operate integrated. During the exercise, the cadets performed these functions as they emerge in real life situations. The company commander is responsible for the planning procedures and for the execution of the plan during the operation. In preparation for this exercise, the cadets had gone through 4 days of extensive training in military decision making processes, practical as well as theoretical.

Based on the battalion's operation order the four groups got 4 hrs to develop their own plan. The planning process was followed by an 8 hrs simulated battle exercise. The cadets' assigned platoon leaders operated the computers. During the battle the role of the platoon leaders was to operate the units according to the company commander's order and to interpret and communicate to the company headquarter (HQ) the situation as it evolved on the screen.

The company commander and the attached officers composed the HQ. The HQ was during the battle located in a different classroom and linked to the platoon leaders by radio. The HQ had to interpret the information provided by the platoon leaders and transfer it into a situational map displaying movements made by friendly and enemy forces. While the simulator reveals the dynamics of weapon effects, weather- and wind conditions, losses inflicted upon the enemy, own losses, artillery field of fire, smoke screens, and visibility to a target and so on, in the HQ these dimensions were drawn on wall charts. During the exercises, the faculty played the role as battalion commanders and facilitators of the different groups.

## VII. The Exercise as It Evolved

After the battalion's order the cadets prepared for the company's operation plan. In this phase, the company commander conducted a preliminary analysis that aimed at answering the following questions; what is the task, what makes up important terrain, what are the capacities and operational patterns of friendly and enemy forces. The attached officers and the platoon leaders awaited the company commander's analysis and his preferred course of action. The commander's preliminary analysis formed the point of departure for delegating responsibilities according to standard for military procedures for operation planning. The logistic officer outlined a plan including medical evacuation and supplies. The intelligence officer outlined the enemy's most likely courses of action and potential worst-case scenarios. The artillery officer planned for the artillery support. The operation plan should respond effectively to the enemy's capacity and assumed movements. Based on the company's operations plan the platoon leaders' deployed weapons, vehicles, observation posts, obstacles, minefields, artillery targets on the computers. During this particular process, the cadets neither engaged in inquiries of the commander's underlying assumptions, nor the work procedures as such. The cadets assigned other roles than company commander seemed to accept that the communication and working process the commander's responsibility. The company commander in turn adapted an efficient, albeit bureaucratic style of command. He subdivided tasks in accordance to the assigned roles in the team, obviously unaware that this leadership style detached the different HQ functions.

## VIII. The Action Phase

After the platoon leaders had deployed the forces and other measures in the CATS, the battle was to begin. During the first hours, the platoon leaders only observed some reconnaissance vehicles attempting to explore new axes of advance along dirt roads paralleling the two main axes along which the company was assigned to fix the enemy. The platoon leaders worried that the enemy either searched for options to outflank the company or to capture terrain that allowed for using their long-range weapons against the different areas of defence. These considerations gave raise to an increasing uncertainty among the cadets operating the HQ. The company commander responded by withdrawing the foremost platoon 4 kilometres from the first line of defence. Realizing that this action did not abide to the intention of the battalion's operations order, the company commander ordered the platoon to re-deploy in the forward defence position. This action pattern recurred several times due to the platoon

leaders' observation of smaller reconnaissance units. After four hours, the platoons appointed to hold the first lines of defence had withdrawn eight kilometres without significant enemy contact. This action allowed an enemy mechanized battalion to capture terrain enabling direct fire against the company's defence positions. The company responded to the enemy's outflanking manoeuvre by withdrawing from its main position and thereby leaving the axis open for enemy advancement.

In this case, the company commander responded to the escalating scenario taking over more and more of the decision making process. This approach prevented the group from inquiring a wider range of action than the ones issued by the group leader. The group emphasised present information without reflecting neither on earlier incidents and actions nor how to apply present information in order to develop a proactive line of action. The subdivision of the tasks seemed to hamper the group's ability to generate creative solutions to problems that emerged along the route. The group's inability to ensure involvement and critical inquiries during the planning phase had caused a dependent pattern of behaviour, which during the action phase blocked for effective decision-making [27]. The dependent pattern created a context featured by defensive communication mechanisms preventing the cadets from expressing disagreements, and hence from making educative experiences [28]. The rigid application of military planning procedure narrowed the cadets ability to gain competence about how underlying assumptions and patterns of interaction might influence their ability to accomplish desirable outcomes [29], [30]. This resulted in a group dynamics in which the situational understanding became static rather than dynamic.

A major challenge of making the cadets inquiring their performance in action was due to unspoken notions of effective military leadership. The relation between the commander's ability for decision-making and the units' performance on the battleground is a prevailing assumption in the Army [31]. In an educational situation, however, there is a need to inquire a wider range of perspectives than merely commanders' skills in adapting to procedures outlined in military manuals. Exercising procedures neither reflecting on the process, nor what it accomplishes prevented the cadets from gaining new perspectives on their thinking and acting. The HQ's inability neither to predict an obvious scenario nor to launch adequate measures to prevent the enemy from capturing key terrain illustrates this point. Professional work requires competence that transcends instrumental skills of following rules [16], [17], [32]. Applying procedures in isolation from new knowledge may prove counterproductive for the learners' ability to develop professional competence by inquiring "other ways of thinking in relationship". This requires a didactic model that allows for bridging theories and practice in an educational context.

## IX. An Experiential Approach to Cats

Professional education anchored in an epistemology of practice denotes a perspective on learning and knowledge production as an outcome of the learners' engagement in reflective practice [33]. To carry out this approach requires a learning environment in which occupational tasks constitutes the ground against which a combination of various theories are allowed to connect. The group's failure to accomplish the mission illustrates that to develop professional mastery in an educational setting requires access to relevant theories. This makes it mandatory to structure the occupational tasks in ways that allows for enhancing cadets' conceptual understanding in action.

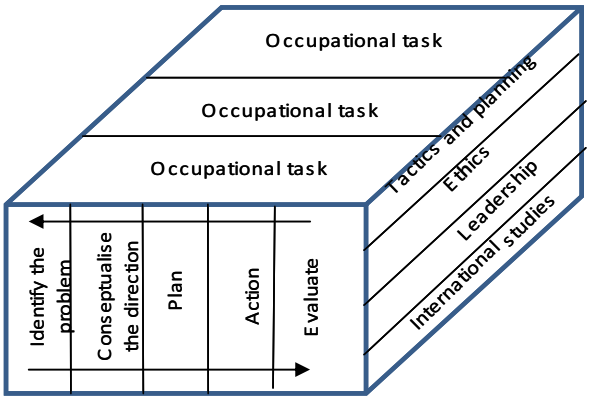


Fig. 2 A matrix approach to the organization of the subjects in higher education

The simulated battle exercise illustrated how action caused unexpected consequences that made the cadets' aware possible blind spots, which before had seemed obvious and opaque [34]. These situations illustrate how an action-oriented approach to learning generates a need to enhance our conceptual understanding.

However, to carry out this approach requires an elastic educational model that allows for undertaking interdisciplinary education integral to work processes of accomplishing occupational tasks (Fig. 2).

Thus, arriving at a multidisciplinary approach calls for a matrix organization that makes it possible to apply a wide range of theories integral to problem solving activities. Fig. 2 outlines key element in such a didactical model for simulator-based training. These elements compose a comprehensive framework incorporating occupational tasks, relevant theories and work processes similar to military planning procedures. The structure of the occupational task determines the potential interdependencies between the supportive subjects, the relationship between the faculties and, hence, the range of educational discourses possible. This model converges with Weick's [20] approach to educational organizations as loosely coupled systems that by feedback mechanisms are constructed and reconstructed in a continuous process (Fig. 2).

The work processes facilitated by the simulated battle scenario not only allowed for incorporating theories and practice, but of equal importance, it directed the learning activities towards the professions main tasks, namely officers' ability to operate and conceptualise various dimensions of the battlefield. Based on this case, the feature of the work process

seems essential in determining the possible allocation of people to tasks and the possible relationships between subjects in an educational setting. Therefore, to create structural similarities between an educational setting and the field of practice requires that we scrutinize the work processes that respond to the challenge of incorporating theories and practice in a simulated battle environment.

## X. Learning through Shared Procedures

In the military, learning from action are usually organized as debriefs or "After Action Review" (AAR). The purpose of the AAR is to evaluate the combat when it is over. However, to develop professional competence from the process as it evolves requires that during mission reviews replace the traditional AAR. During mission reviews, provide space for learners to discuss a broad range of topics close to their appearance. Figure 3 illustrates a didactic model that allows for making during mission reviews a natural and timely element in simulated battle exercises. The design both account for existing military work processes and an experiential learning approach that allows for exploring the process and its accomplishments in practice [9]. Fig. 3 provides a generic didactic model for organizing and analysing simulator based exercises as experiential learning.

Fig. 3 conveys a perspective on learning an outcome of learners' engagement in iterative cycles of action and reflection. The cyclic form indicates that learning requires application of what we already know in order to gain knowledge from or cope with a new problematic situation. The ability to integrate new experiences into existing knowledge allows for discriminating between experiences that are educative from those, which are misleading [3]. This framework is based on the learners' ability to share and utilize experiences in relation to problem solving activities. Hence, the didactic model entails a process of transforming individual experience, through interpretations and negotiations, into restructured shared knowledge among those engaged in the activity.

The outlined steps 1 – 8 display the process in which experience facilitates the activities of formatting and accomplishing an operational task. The steps are both visualising sequential steps in the process of solving a concrete problem and can be explained as process components essential for experiential learning to take place. Although the steps signify a sequential pattern, in practice they take shape in a forward and backward movement, in which the different steps recycle throughout the process of completing the cycle. There certainly will be many parallel cycles and feedback loops attaching to each of the steps in the cycle. The reflective activities between the outlined steps in the cycle indicate arenas in which the activity freezes allowing for new perspective / theories to enter the process. The idea is that each step is followed by instructional reflections and reframing questions. We suggest the orchestration of reflections coupled with relevant theories allows for carry out an interdisciplinary approach integral to military planning and decision-making procedures in higher education. The danger of neglecting the need for new theories during the process is that the students ends up skilled in following recipes, but unknown to relevant analytical concepts. Thus, building professional competence in action requires work processes that similarly allow for applying a wide range of theories to concrete situations and that enable communication among different parties accomplishing a mutual task.

The process starts with a concrete experience, which in this case was the mission assigned to the company. The next steps compose a *preliminary interpretation of the task* and the following *analysis of potential courses of action*. This direction-setting process prepares for *modelling the operation plan.* The last step encompasses *the implementation of the plan in action*. The consequences of action may demand adjustment and accommodation of the original plan. This makes it fundamental to reconstruct the initial plan in parallel to its implementation in action. Hence, we claim that learning in action requires learners' extensive involvement in successive cyclical phases of *planning*, *acting, observing, interpreting the outcomes* and *the reconstructing the plan*. This action-based didactic model builds upon the principles of making visible, sharing and collectively reflecting upon one's own and others' understanding and how these reflections influence following action. The process is open-ended, which indicates that the observed consequences of action generate a need for knowledge anchored in practical experience. This knowledge may ease the process of reframing available perspectives in ways that foster new learning and new courses of action. The experiential learning approach to CATS offers a feasible strategy both to reveal theories potential to provide social meaning and their ability to improve the learners' understanding of the problematic at hand [35]. The didactic model not only comprises key elements for understanding learning as shared procedures in a simulated battle environment. The experiential learning model confines a developmental framework as well. This framework may promote:

a) Students' reflections on their learning process.
b) Application of theories to practical situations.
c) A multidisciplinary approach that facilitates guided reflections, questions and discussions connecting theories to arenas in which the profession is executed.
d) The faculties' reflection on the educational model in relation to the structure of the educational task. This creates openings for developing the education from within teachers' practice.
e) The repeated cyclical process might lead to the development of new concepts within the context of the educational task. Applying simulator-based training not only allows for bridging theories and practice, it also nurtures teachers' exploration of the educational organization as a place for learning and development. Conclusively, the transition from a "rigid" task model to a matrix essentially entails a transition from a static system of education to a learning system at both the individual and the organizational level [13]. CATS potential for bringing together theories and practice may provide a tool for carrying out this transformation from within teachers' practice.

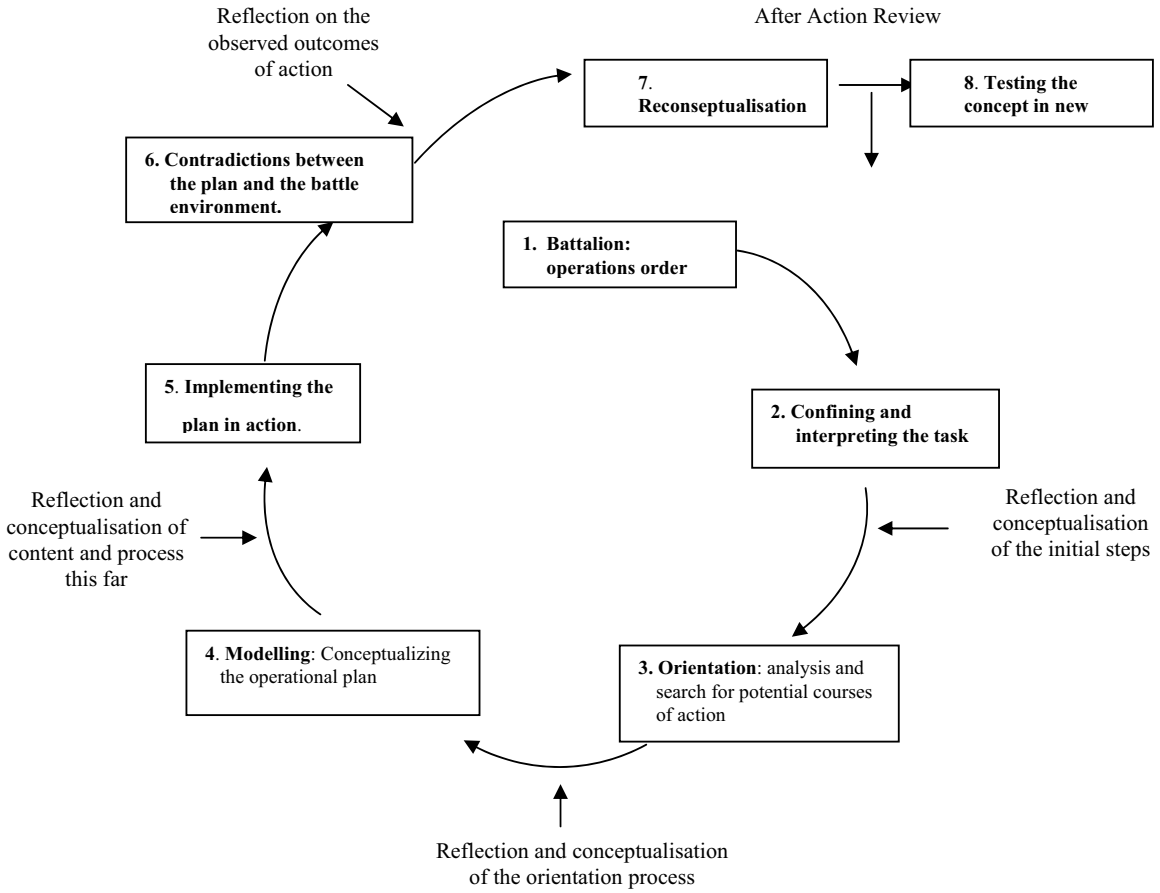


Fig. 3 A didactic model for bridging theories and practice in simulated battle environments

## XI. Concluding remarks

We have argued for the use of simulation-based technology as a tool for constructing a learning environment resembling the "real ones". To develop students skilled in analysing the situation in which work takes place requires arenas encouraging concept development and critical reflections in action. Applying CATS to develop professional competence requires access to theories providing meaning for those solving the problem, but who might are unfamiliar to the concepts in the first place. To make theories useful requires orchestration bringing together practical discourses and various perspectives on practice. Through this study we have identified some openings for applying theories integral to military planning procedures in an educational setting, but we maintain that these openings for higher "order learning" in a simulated environment, require that we direct our attention towards learning as social practice. We have argued that CATS provide a technology allowing for structural similarities between the field of practice and the educational context in ways that enables learning through shared procedures.

The work processes are accordingly fundamental to construct similarities between occupational education and military practice. On this background, we have developed a generic didactic model that stems from a social constructionist view on knowledge creation and change [6], [36]–[38]. This position signifies a process whereby the participants construct new meaning and transforms their experience into applicable knowledge through their participation in social practices similar to real life situations. However, in our enthusiasm to address work processes we should be aware of not creating an educational environment that develops leaders able to apply simple skills to achieve productivity aims, but who lack necessary competence to analyse military organization as a place for learning and development. The use of computer-aided training should arrive as close as possible to the latter ideal.

## References

[1] M. Levin and D. Greenwood, "Pragmatic Action Research and the Struggle to Transform Universities into Learning Communities," in *Handbook of Action Research,* P. Reason and H. Bradbury, Eds. Sage: London, 2001, pp 103–113.

[2] D. A. Schön, *The Reflective Practitioner. How Professionals Think in Action.* Basic Books. New York, 1983.

[3] J. Dewey, *Experience and Education*. Touchstone: New York, 1938/1997.
[4] J. Dewey, *Democracy and Education*. Southern Illinois University Press: Carbondale, 1916/1985.
[5] P. Freire, *Pedagogy Of The Oppressed.* Penguin Books: London, 1970/1996.
[6] A. C. Baker, P. J. Jensen, and D. Kolb, "Conversation as Experiential Learning. Management Learning". Vol. 36, no 4, pp 411-427, 2005.
[7] J. Lave and E. Wenger, *Situated Learning: Legitimate Peripheral Participation*. Paolo Alto, CA: Institute for Research on Learning, 1991.
[8] B. Rogoff, "Developing understanding of the ideas of communities of learners". *Mind, Culture and Activity*, Vol 1, pp 209-229, 1994.
[9] D. A. Kolb, *Experiential Learning: Experience as the Source of Learning and Development*. Prentice Hall: New Jersey, 1984.
[10] D. Boud, R. Cohen, and D. Walker (eds.), *Using Experience for Learning*. Buckingham, England: Society for Research into Higher education and Open Learning Press, 1993.
[11] R. Miettinen and S. Peisa, "Integrating School-based Learning with the Study of Change in Working Life: the alternative enterprise method". *Journal of Education and Work*, Vol 5, No.3, pp 303-319, 2002.
[12] J. Xu, "Developing a Taxonomy of Characteristics and Features of Learning Systems and Internetgaming Environments". Report Air Force Research Laboratory Human Effectiveness Directorate Warfighter Readiness Research Division, 2006.
[13] P. Herbst, "Maps of Knowledge and the Design of Educational Organizations". *Nordisk Forum*, Vol.6, No. 3, pp.171-188, 1971.
[14] H. Beinum, C. Faucheux, and R. van der Vlist, "Reflection on the Epigenetic Significance of Action Research," in *Beyond Theory,* S. Toulmin and B. Gustavsen, Eds. John Benjamins: Amsterdam, 1996, pp 179-202.
[15] J. Burke, "Expertise, Jurisdiction, and Legitimacy of the Military Profession," in *The Future of the Army Profession,* D. M. Snider and L. J. Matthews, Eds. McGraw- Hill: New York, 2005, pp 39-60.
[16] A. Abbot, *The System of Professions. An Essay on the Division of labour*. The University of Chicago Press: Chicago, 1988.
[17] E. Freidson, *Professionalism. The Third Logic*. Blackwell: Oxford, 2001.
[18] Ø. P. Pålshaugen, "The Use of Words: Improvising Enterprises by Improving their Conversations," in *Handbook of Action Research,* P. Reason and H. Bradbury, Eds. Sage: London, 2001, pp 209–219.
[19] S. Toulmin, and B. Gustavsen, Eds. *Beyond Theory*. John Benjamins: Amsterdam, 1996.
[20] K. E. Weick, "Educational Organizations as Loosely Coupled Systems". *ASQ*, Vol. 21, 1976.
[21] M. Fullan, *The New Meaning of Educational Change*. Teacher College Press: New York, 2001.
[22] P. G. Herbst, *Alternativ til hierarkisk organisasjon*. Tanum Norli. Oslo, 1977.
[23] I. Goodson, *The Making of Curriculum*. The Falmer Press: London, 1998.
[24] L. Stenhouse, *An Introduction to Curriculum Research and Development*. Heinemann Educational: Oxford, 1975.
[25] F. Gravem, Internal Note on the Pedagogical Approach at the Military Academy. Oslo, 1993.
[26] The GESI simulator system. www.cae.com.
[27] I. L. Janis, *Groupthink*. Houghton Mifflin Company. Boston, 1982.
[28] C. Argyris, *Bryt forsvarsrutinene: Hvordan lette organisasjonslæring*. Oslo. Universitetsforlaget, Prentice Hall International, 1990.
[29] C. Argyris and D. A. Schøn, *Organizational Learning, a Theory of Action Perspective*. Reading. MA: Addison-Wesley, 1978.
[30] C. Argyris and D. A. Schøn, *Organizational learning II*. Reading, MA: Addison-Wesley, 1996.
[31] B. P. McCoy, *The passion of command: The moral imperative of leadership*. Marine Corps Association, 2007.
[32] D. M. Snider and L. J. Matthews (eds.), *The Future of the Army Profession*. McGraw- Hill. New York, 2005.
[33] D. A. Schön, *Educating the Reflective Practitioner*. San Francisco: Jossey-Bass. 1987.
[34] J. Dewey, *How We Think*. New York. Dover, 1910/1997.
[35] B. Gustavsen, "Making Knowledge Actionable. From theoretical centralism to distributive constructivism". *Concepts and Transformation*. Vol 9, no 2, pp 147-180, 2004.
[36] B. Gustavsen, *Dialogue and Development. Theory of communication, action research and the restructuring of working life.* Van Gorcum: Assen Maastricth, 1992.
[37] Ø. P. Pålshaugen, *The End of Organization Theory*. John Benjamins: Amsterdam, 1998.
[38] J. Shotter, *Conversational Realities*. Sage. London, 2002.