Applying the SECI Model and Bloom's Taxonomy to the Preparation of Knowledge Management Specialists

JOZEF HVORECKY

Vysoká škola manažmentu/City University of Seattle, Bratislava, Slovakia
University of Liverpool, Liverpool, United Kingdom

Abstract. Learning (in its broad meaning of "knowledge gaining") represents one of the Knowledge Management pillars. It can be studied from different angles. The SECI learning model by Nonaka and Takeuchi presented knowledge as an eternal process running in human communities. It shows how learning is born and growing in individuals and society. Bloom's taxonomy is a key learning model in pedagogy. It serves as a benchmark for measuring a level of knowledge gained by a learner.

In our paper we analyze both models from the point of view of the preparation of future managers working in in-class and online environments. We indicate how student group projects can serve as a tool forming collaboration skills and enhance tacit knowledge necessary for becoming valuable members of Learning Organizations.

1 Introduction

Learning (in its broad meaning of "knowledge gaining") represents one of the Knowledge Management pillars.

As a subject, knowledge can be studied from different angles. The most common approach studies its role in organizations. Its implementation requires [1]:

  A repository
  A social networking platform
  A social collaboration platform

A more detailed view to the development of these components is done in [2]. The phases represent growing inclusion of knowledge management into the organization life and processes. The presented sequence depends on the technology base coming from the simple knowledge repositories to complex collaborative platforms. The desired goal of the development is Learning Organization. The table indicates that it incorporates all elements from three previous stages.

Table 1. Stepwise development of knowledge codification

Codification Strategy			
	People	**Organization**	**Technology**
Unawareness phase	None		
Knowledge repository phase	Appraisal, Competence leverage	Slack, System integrated into daily work process	Knowledge repository
Knowledge roadmap phase	Knowledge crew	Knowledge champion, Metric	Knowledge roadmap
Collaborative platform phase	Trust, Care, Empowerment	Climate of openness, Dialogue, Community, Collaboration	Collaborative platform
Organizational learning phase		Organically structured organization, Learning organization	

In [3], the reader finds another characterization of learning organization by naming its 11 features:

  A learning approach to strategy;

  Participative policy making;

  Informative and collaborative;

  Formative accounting and control;

  Intensive internal exchange of information and knowledge;

  Reward flexibility;

  Boundary workers as environmental scanners;

  Inter-company learning;

  Enabling structures;

  A learning climate;

  Self-learning opportunities for all.

The above approaches look at the knowledge management implementation from a purely managerial point of view. They see it predominantly as a tool for building a more efficient organization and less as an inter-human activity. As such they are not very applicable in education.

Van der Brink [2] also elaborated another phasing which reflects human side of the transfer of a company into Learning Organization – see Table 2.

Table 2. Stepwise development of personalization strategy

Personalization Strategy			
	People	**Organization**	**Technology**
Unawareness phase	None		
Collaborative platform phase	Trust, Care, Appraisal, Competence leverage, Empowerment	Climate of openness, Slack, Dialogue, Community, Knowledge champion, Collaboration	Collaborative platform
Knowledge roadmap phase	Knowledge crew	Metric	Knowledge roadmap
Knowledge repository phase		System integrated into daily work process	Knowledge repository
Organizational learning phase		Organically structured organization, Learning organization	

This phasing better show better explains the role of humans in the development. It has to start with collaboration. People must care about their mutual knowledge and trust to each other. The management must support the knowledge growth by appraisal, creating an open and slack atmosphere. Knowledge Champion – a leading personality in knowledge creation and sharing – should be found. In the optimal case, he/she is a member of the top management who understands and is interested in knowledge sharing within a company and has the power to influence and to give commands leading to changes. As such, he/she is capable to empower the employees and to enhance building of knowledge crew. By building appropriate metrics, one can measure how successfully are the knowledge management principles incorporated into daily work processes and, consequently, into the profitability of the company.

The key principle in Table 2 construction is "personalization". The term can be interpreted as "creating an appropriate environment for optimal exploitation person's capability". In educational field, it implies implementing methods leading to the desired profile of graduates.

Our research concentrates on analyses of two learning models:

Bloom's taxonomy is widely used in pedagogy and serves as a benchmark for measuring the level of knowledge gained by a learner in a particular field.

The SECI learning model by Nonaka and Takeuchi is more oriented to knowledge genesis and growth and presents it as an eternal process running in human communities.

While the Blooms' taxonomy allows measuring a person's knowledge in an isolated moment, the SECI model concentrates on its "ecology". In our paper, we try to how their specifics could contribute to a holistic preparation of Knowledge Management students. We use van der Brink's second approach as a benchmark and compare it with the both models and show options for their applicability in in-class and online environments.

2 Setting up benchmarks

In accordance to the above descriptions of organizations using knowledge wisely and efficiently, the preparation of future managers should concentrate on the following issues:

Trust,
Care,
Appraisal,
Competence leverage,
Empowerment,
Climate of openness,
Slack,
Dialogue,
Community,
Collaboration
Knowledge champion,
Skilled exploitation of a collaboration platform.

Our choice is purposefully derived from the Collaborative Platform Phase in Table 2. This phase has been selected as our basic benchmark because it is the lowest of four stages leading towards Learning Organization. To become valued members of their future teams, graduates must be trained within environments that demonstrate them. Such education makes them capable of recognizing their advantages and ready to join the teams which already reached this particular one or any of the higher levels.

Thus, our assessment of educational models will measure to what degree they reflect the above components.

3 Analyzing the SECI Model

From the point of view of Knowledge Management theory, only one item *Skilled exploitation of a collaboration platform* belongs to a piece of explicit knowledge. All others have its place among tacit elements. To accommodate them inside our knowledge weaponry requires more detailed analysis of their positions in the SECI model (see Figure 1).

The SECI model [4] is a subject-independent model describing the relationship between explicit and tacit knowledge. Its original purpose is to demonstrate the way of knowledge

development inside organizations but it can also help to describe how individuals execute their self-thoughts and insights.

	TACIT KNOWLEDGE	EXPLICIT KNOWLEDGE
TACIT KNOWLEDGE	**Socialization**	**Externalization**
EXPLICIT KNOWLEDGE	**Internalization**	**Combination**

Figure 1. The SECI Model

Bearers of tacit knowledge interact with bearers of (possibly different) tacit knowledge during *Socialization*. It is performed by interpersonal communication and/or intrapersonal insights. This is the most traditional form of learning and is present in any human community. To perform it properly, *Climate of openness* and interpersonal *Trust* is necessary. Students should enjoy the in their classrooms to learn to act adequately. If they accustom to them, they will expect (and hopefully require) their presence at their future workplaces. Dialogue is the most frequent method of socialization so it should be intensively used in education, too. It should run not only between teachers and students but also among students themselves (with advanced learners helping and supporting the others). As [5, 6] show, in online environments, it can be also done by using virtual classrooms.

To achieve a person-independent knowledge, people try to express their internal understanding of objects and methods in a commonly accepted way using various forms of *Externalization*. That results in discussion of a subject in a standardized, comprehensible format. These presentations (numbers, texts, graphs, formulas, etc.) create a basis for the wider distribution of knowledge. Here, *Skilled exploitation of a collaboration platform* can be helpful as it will enhance presentations of individual pieces knowledge in a commonly accepted format. The externalization requires intellectual effort as its outcome should be well-supported by arguments and legible. To award these efforts, there should be an *Appraisal* system because properly expressed ideas serve as *Competence leverage* to the entire team. As we know, a properly asked question already contains a half of the answer. Thus, expressing a problem in a right way can accelerate its solution. In virtual classrooms it means to create a *Slack* atmosphere in which the participants (students and less experienced team members) are not afraid of expressing their "wild" innovative ideas and hypotheses.

The pieces of knowledge expressed in during externalization are processed by their receivers. Their *Combination* may lead to new pieces of knowledge but it requires examining blind roads as well. *Empowerment* and *Collaboration* are tools to encourage the experimentation and investigation of indefinite directions. The mutual understanding of entire *Community* is crucial to the success as the blind ends must be disclosed and openly discussed. Their authors must not be ashamed (unless their failures come from their ignorance or negligence).

In the last stage, people try to interpret the outcomes of their activity and want to comprehend them. Through *Internalization*, the new piece of knowledge becomes an integral part of their individual and team knowledge. Here, the role of *Knowledge champion* is irreplaceable. He/she should play a key role as a unifier who condenses "the spirit of the team" and carry it out. At the same time, he/she should *Care* about proper internalization of the gained knowledge (e.g. including the outcome implementation) in order to make everyone aware that their personal involvements have been valued and praised.

The above analysis shows team problem-solving assignments as the best training method. By forming teams (either real or virtual), the entire life-cycle of the SECI model can be experienced by the learners. On one side, the problems should be small and simple enough to

be solved them in limited classroom conditions. On the other hand, they should be large and difficult enough to allow the students to present their problem-solving and communication skills as well as to evaluate correctness of a solution. The practical recommendations on organizing of appropriate teaching methods are in Conclusion.

4 Analyzing Bloom's taxonomy

Bloom's taxonomy [7] shows the development of knowledge in a six-level pattern. We prefer its contemporary formulation in which two highest levels are interchanged [8]:

Remembering (facts, terminology, formulas & their execution, etc.),

Understanding (grasping meaning of concepts and relations among them, ability to describe them),

Applying (using gained knowledge in new situations),

Analyzing (seeing patterns, recognizing hidden meanings),

Evaluating (critical assessment of results, verification of evidence).

Creating (formulation of hypotheses, solution planning and reasoning, improving the outcome).

The relation of this hierarchy to van der Brick is not as straightforward as that of the SECI model. The reason is obvious. Both van der Brick and the SECI speak about Knowledge Management. Bloom speaks about the depth of gained knowledge. Its direct application is possible to explicit knowledge. In the case, there is only one component of this type: *Skilled application of a collaboration platform*. Other expected components have a tacit character.

First, notice that a learner is not required to achieve the maximum level in all components. To be a useful player in his/her team, the person just needs first three hierarchy levels of *Skilled application of a collaboration platform*. He/she has to remember how to operate the platform, to understand the effects of his/her commands and to be capable of applying them when needed. The next three levels – the analysis, evaluation and creation – are mostly important for the technology developers, not so much for its users.

Another field to which Bloom's hierarchy can be applied is the team members' professional competence. In this case, the team's goal should be its maximization. Still, different team members might specialize to different functions and to reach the optimal effect via their synergy.

The rest of team's competence belongs to tacit knowledge. Measuring it is more difficult and complicated. There is even no need for measuring it in individuals because these individual values not necessarily mean the team's success. As Lenconioni's research [9] shows, the critical indicator of dysfunctioning teams is *lack of trust*. It leads to fear of conflict, lack of commitment, avoidance of accountability and, consequently, to inattention to results. For that reasons, the *Trust* component requires a constant care up to level of its evaluating and (re)creation. It should reach its maximum level.

Another important factor is a proper management of the team. Here, the role of Knowledge Champion is decisive. He/she should be a leader capable of providing structure, support and direction for the team during the 'forming' stage. Later, he/she should motivate the team and to improve its performance. In some cases such a person can appear suddenly from the middle of the group and become its natural leader.

To understand the functions of a team, its formation, development and cohesion, the students must plays various roles in it up to the group leader.

5 Combining the Methods

The analysis of Bloom's taxonomy shows that the majority of the expected skills belong to human's tacit knowledge. It coincides with the results of [10] in which the authors show a extensive role of not-fully-rational components in the SECI model – see Figure 2.

Socialization	Externalization
Story-telling Discussion Listening to other opinions Opposing common opinions Playing a devil's advocate Showing example behaviour Teaching and training Brain storming	Speaking and writing excellence Capturing of the idea's core Formalization Introduction of a new notation Posing "right" questions Demonstrating skills
Internalization	**Combination**
Digesting of a new piece of knowledge Practicing a new activity Implementing a problem solving method Learning a new formal notation Becoming interested in the topic Estimating of potential "usefulness" of knowledge	Lateral thinking Creating analogies Selection of the right knowledge processing method Identification of the new piece of knowledge

Figure 2 Irrational factors in the SECI model   Source: Hvorecký, Šimúth, Lichardus [10]

Contemporary educational methods mostly contradict to the above observations. They concentrate on explicit knowledge and manipulation with it. In the SECI diagram, these manipulations belong to *Combination* – the transfer of existing explicit knowledge into (possibly new) explicit knowledge. As a result, large areas of necessary knowledge, skills and experience are omitted. As the title of [11] also indicates, tacit knowledge can hardly be incorporated, it must be *enabled*. It implies a call for educational approaches containing this empowerment as its integral part.

6 Team Projects in In-class and Online Education

Tacit knowledge can be enhanced in various ways: by class discussions, individual research projects, case studies, and similar. As we are interested in preparing future members of learning organizations, the group cooperation and evolvement are in the center of our interest. Group projects are excellent tools offering this kind of experience [12]. During their completion, the students will have opportunities of witnessing various real-life situations. Many of them depend on the factual creation of the group and hardly can be predicted. To build a successful group project, its cautious design is necessary. It should contain at least solving the following issues:

Project topic design: Should the project be continuing during the term or consisting of several separate stages? To what degree should the project and the theoretical content of the course overlap? What elements of tacit knowledge will be stressed?

Group Formation Rules: What is an optimal size of a group for the particular sort of problems? Should the instructor compose the groups or should the students form them on their own will? Will the composition of the group be permanent or will it change during the term? Will there be a permanent leader of the group or will the function rotate? In the case of online project, another key question must be solved: Should the students in a group come from geographically near or geographically distant locations?

Group Cooperation Rules: Should the group members select their leader by themselves or will it be the decision of the educator? Who will distribute the workload? Can a member skip a period (e.g. due to family or health problems)? Can the members of other teams see the partial outcomes of their co-runners? If so, what and when? To what degree can the educator interfere with the group activity? How to act in the group cooperation failure?

Grading: What should be the project evaluation criteria? Should be the group graded as a whole? If not, how to measure contributions of its individual members? Should be the group leader involved in the grading? If so, how? Should be the members of other groups involved in reviewing (or grading) their co-runners' outcomes?

Whatever decisions are made, they should be published in the group project assignment. It can have two forms: for educators and for students. The students should be given them prior to the project solution.

The author included a six-week long group project into his course *People, Technology, and Management* developed for the Laureate online Master program at the University of Liverpool. For five weeks, every group works in isolation within its own working area. In the sixth week, the projects are made public. Every group is assigned as a reviewer for another group. The reviewer's role is to comment the quality of their partner project and contribute to its improvements. To form a collaborative spirit, the reviewers as specified as "investors" – a group which plan to invest the proposed project and consequently is interested in its growing quality.

Despite the fact that students are dispersed around the globe, their cooperation is predominantly excellent. In their course evaluations, they are very satisfied with their experience, in particular with a unique opportunity to work in an international team with its pros and cons of multiculturalism.

Group projects have been a part of the International Summer School "Introduction to Knowledge management" organized by Vysoka skola manazmentu from 2008 to 2010. The students came from partner institutions from Czech Republic, Finland, Lithuania and Slovakia. Their aim was to prepare a project on a selected topic in Knowledge Management. The teams have to comprise of four representatives from different countries. The summer school had a format of an intensive course lasting just two weeks. As a large part of the course was based on lecturing, the students had to accomplish their entire project within three days (plus a day for preparing its public demonstration). As a result, the participants had to work under stress. They had to search for their sources over the internet, compare and compile their findings and combine them into a meaningful outcome. For the most of them, it was their first experience in an international environment. They had to overcome their language barriers often. Again, the project was highly valued by the participants. They appreciate the opportunity to face a variety unexpected challenges, to collect out-of-school experience and to learn how to develop working relationships with their just-met partners.

7 Conclusions

Tacit knowledge can appear as a result of two principal ways of experience. It can appear as a side-effect of a person's day-to-day activities or as a result of controlled processes. In the former case, its presence is a coincidence of a series of random situations that may (and may not) lead to desired skill or a piece of knowledge. One of the main aims of education is artificial and purposeful creation of modeled situations. Above we have demonstrated group projects – a classroom activity enhancing collaboration, teamwork, leadership, and exchange

of knowledge. As the author's experience shows, it can be successfully incorporated into online environment by creating virtual workplaces for each group. Even if there is no full warranty that requested skills will appear and last, their probability rises substantially as they are requested to face the challenge.

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Contact data (repeat for every author):
Jozef Hvorecký, Prof. PhD.
Vysoká škola manažmentu / City University of Seattle
Panónska cesta 17, 851 04 Bratislava, Slovakia
jhvorecky@vsm.sk