International Training Center in Savonlinna

as Finnish-Russian-Chinese cooperation for sustainability

Markku Kankkunen
Ph.D. of Education, Director of Educational and Cultural Development, Savonlinna
markku.kankkunen@savonlinna.fi
Kati Mäkitalo-Siegl
Professor in School of Applied Educational Science and Teacher Education, Savonlinna Campus, University of Eastern Finland
kati.makitalo-siegl@uef.fi
Fedor Timofeev
Vice-principal, Gymnasium 32, St.-Petersburg
fedor@edmasterz.org
Alexander Voronov
Professor in Saint-Petersburg State University of Economics, Russia
voronov.a@unecon.ru

Abstract

The aim of the paper (???) is to present the International Training Center in Savonlinna (ITCS) and collect the data to start the training. This evaluation is needed as school cultures in Finland, China and Russia do differ a lot. However, there are also goals to be shared: in China nation-wide renewal has started to improve the curriculum work following the frame of Finnish PISA-experiences, and the district of Vasilyevsky Island, Saint-Petersburg has taken ambitious steps in schooling planning, while the new Finnish curriculum was introduced in August 2016. So, the international cooperation may enrich every partners' output in education.

Based on the agreement between the municipality of Savonlinna, Finland, and Haidian district in Beijing, China, the work of the Training Center is to start with the first Chinese group of Haidian principals and educational officials visit. The focus of the inquiry-based and practical training for the participants is to explore how Finnish curriculum and management work and what kind of learning environment is created by Finnish teachers to enhance students' learning instead of memorizing the content. The samples for this approach come mainly from the senior secondary School of Art and Music, Savonlinna. The emphasis is made on the integrative studies of curriculum themes, e.g. sustainability studies at senior secondary levels. In order to get a new set of learning activities, the organization of ITCS needs careful planning, constant development and professional evaluation. To benefit all partners involved in this work, experience in our enterprise cooperation with Saint-Petersburg State University of Economics (UNECON) and our partner schools in Vasilyevsky Island, Saint-Petersburg, will be studied.

During the 8-day training program researchers collect the data from the Chinese participants via questionnaires and interviews to be further analyzed. The Chinese participants also make a portfolio on the introduced Finnish learning activities. However, some tentative results will be presented at the ISNITE conference (UEF 2016). Besides the observations in the classes, a theoretical background for effective learning environment will be offered.

The undertaken approach includes the studies of so called "21st century skills", meaning actually a versatile usage of different kinds of learning methods at education for sustainability. A thorough research has been done in this field. We do expect that an inquiry-based approach will deepen the participants' knowledge about different factors which influence the entire education system in Finland. Also, the approach presented here gives an important evidence to develop the courses for the future groups to visit and study in Savonlinna and Saint-Petersburg.

Key words: training for sustainability, research on practical needs of educators, international cooperation with Finland, China and Russia

INTRODUCTION TO LIFE CYCLE THINKING APPROACH

The role of education in promoting economic wellbeing, with a particular focus on the role of educational quality is well known[1], and it has been concluded that there is strong evidence that the cognitive skills of the population – rather than mere school attainment – are powerfully related to individual earnings, to the distribution of income, and to economic growth. New empirical results show the importance of both minimal and high level skills, the complementarity of skills and the quality of economic institutions, and the robustness of the relationship between skills and growth.

Connecting Life Cycle Thinking (LCM) [Voronov 2011; Voronov 2012] into the goal to establish International Training Center in Savonlinna (ITCS) is the main core in cooperation with Finnish-Russian-Chinese partners. However, the balanced cooperation with all partners is a challenging task. In practice, cooperation agreements or Letters of Intent (LOI) are still in the making between Finnish-Chinese partners and the actual in-service studies for Chinese educators will start during the year 2017. This means that the cooperation project will fall behind the tentative schedule but this kind of international planning needs administrative acceptance of all partners. We can call it "time-out" which is sometimes necessary to get the best possible output in the long run "in order to win the game". During the process, our Finnish-Russian cooperation experiences can be nurtured and developed further to benefit the actual goal of ITCS and LCM.

International comparisons incorporating expanded data on cognitive skills reveal much larger skill deficits towards the globalization challenges. The magnitude of change needed makes clear that it will require major structural changes in schooling institutions. As to the skills for sustainable development, we need an education that takes us into the depth of things to provide the "Generation for Sustainability" [Kankkunen et al., 2013]. Sustainability demands a specific kind of training. Sustainability Skills, as the "21st century skills" (SuSki21), is not just another issue to be added to overloaded curricula, but a gateway to a different view of curriculum, pedagogy, organizational change, policy and particularly of ethos. Followed by this, among the globalization challenges of 21st century the multidisciplinary information complexity that we need to attain the sustainability targets looks as the corner milestone. To solve a problem of the sustainability level, there is the need for a design activity, comprised of the collaborative multi-criteria decisions towards joining the multidiscipline knowledge. Attitudes are also important, and moreover, it is often necessary to change social structures to be ready for sustainability mode. Changes in attitudes take time and need a place for observation and reflection on how attitudes influence our behavior and acceptance of ideas. Indeed, in SuSki21, it is difficult to identify what needs to be solved, and it is also not clear how to solve the problems that have been identified. There has been no consensus on the underlying question of "What is structuring knowledge in Sustainability Skills?" And now there is the need for focus on knowledge structuring and creative thinking. The efforts undertaken address the key challenges associated with knowledge structuring in SuSki21, identify the requirements for the structuring of knowledge, propose reference models, and develop an ontology-based mapping tool as a solution-approach. At the same time, the effect of patterns of non-sustainability on our current and future prospects is so pressing that the response of the education system, i.e., continuous education, should not be predicated only on the "integration of sustainability" into teaching, because this invites a limited, adaptive response. We need to see the relationship the other way around, that is, the necessary transformation of training efforts towards the integrative and holistic approach implied by a systemic view of sustainability in education and society [Kankkunen, 2010]. There are many drivers and barriers identified when trying to embed sustainability within the curriculum, and many attempts

[1] The role of school improvement in economic development. Hanushek E., Woessmann L. 2007, www.SSRN.com

have been taken already in order to achieve this goal. There are mainly four strategies applied: (1) a compulsory course for all graduates at 1st level; (2) a minor or track on SuSki21 in both 1st and 2nd level studies; (3) assuring the introduction of SuSki21 in the final thesis/project of graduation, and (4) intertwining sustainability in all the subjects/courses of the curriculum. Up to the present embedding SuSki21 in the entire curriculum has been shown to be the most difficult strategy to be perched. The approaches applied so far (to facilitate learning tools, develop learning materials, training lecturers, etc.) have been shown to be necessary but not enough. The calls for the training activity comprised of the individuals' interaction and supported by a system of decision making in small groups, i.e., groupware information and communication technology, as the most adequate avenue to the collaborative specialists, seems to open new horizons of introducing SuSki21 into the whole curriculum.

Along with the attempts to capture the main features and quantities in sustainability problems the performance indicators technique is well recognized after the ten-year history of Life Cycle Thinking (LCT)[2]. LCT is approaching the implementation phase. With the rational heuristic approaches, innovations well based on the market theory are now available. In turn, below we introduce the family of LCT instruments under the strategic network concept that starts from "skills" (continuous education system for professional competence aimed at sustainable development), through "innovations" (market competitive advantages based on research and technology developments) to "infrastructure" (cooperative efforts for effective activity allocations). LCT concept provides wide prospects to follow a promising sustainability paradigm through educational efforts. Based on the multi-criteria approach, the LCT concept is modeled by the life cycle chain, with its economic, environmental, and social criteria through the innovative market instruments towards combining private and public interests [Voronov, 2011; Voronov, 2012]. The value chain at LCT concept consists of four stages: mining, production, consumption, treatment, and provides three markets for resources, goods, and wastes. Every market has supply and demand interests (private) as well as environmental and social interests (public). The desired interests have to be introduced as the measure for the discrepancy of the necessary balance (equilibrium) conditions at the appropriate markets. The market signals, being experimentally observed, provide enough basic information to calculate these indicators. Two groups of criteria will control the market: economic (by supply and demand), and environmental and social (by damage power). A similar approach could be used also to analyze the value chain specified for transforming the human resources matched with the problems of continuous education for sustainability [Kankkunen et al., 2013]. Having in mind the concept of LCT, we can study the functional system "Generation for Sustainability" with the objective of helping youth to contribute to informed decisions for sustainable development, and to act upon these decisions, which provide a strong basis to introduce the family of LCT instruments and the valuable measures for innovations in information and communication technology and curricula.

PROPOSALS FOR CURRICULUM DESIGN

Based on the LCT approach incorporation of social, economic and environmental aspects of sustainability into continuous education system has been tested. This included case-study initiatives e.g., "Short courses for business" (Finnish-Russian Seminars for Environmental Experts / SYKE and UNECON), "Summer schools for youth" (Finnish-Russian Cooperation Research Initiative on Sustainability Sciences and Entrepreneurship for Double Diploma High School / UNECON and UEF), and "Initial Chinese Language Training" (Cultural and Educational Forum in St.-Petersburg / Chinese Consulate General in St.-Petersburg, Gymnasium 32 and UNECON). In our examples, tested in Finnish-Russian-Chinese cooperation, we have undertaken an international effort to invigorate a discussion of how sustainability should be integrated into the high-school

[2] UNEP/LCI: www.lifecycleinitiative.org

and university curricula, locally and globally, besides, we have added global ecological and economic goals, and also the "big cultural picture", as we call it, into a curriculum framework (Figure 1).

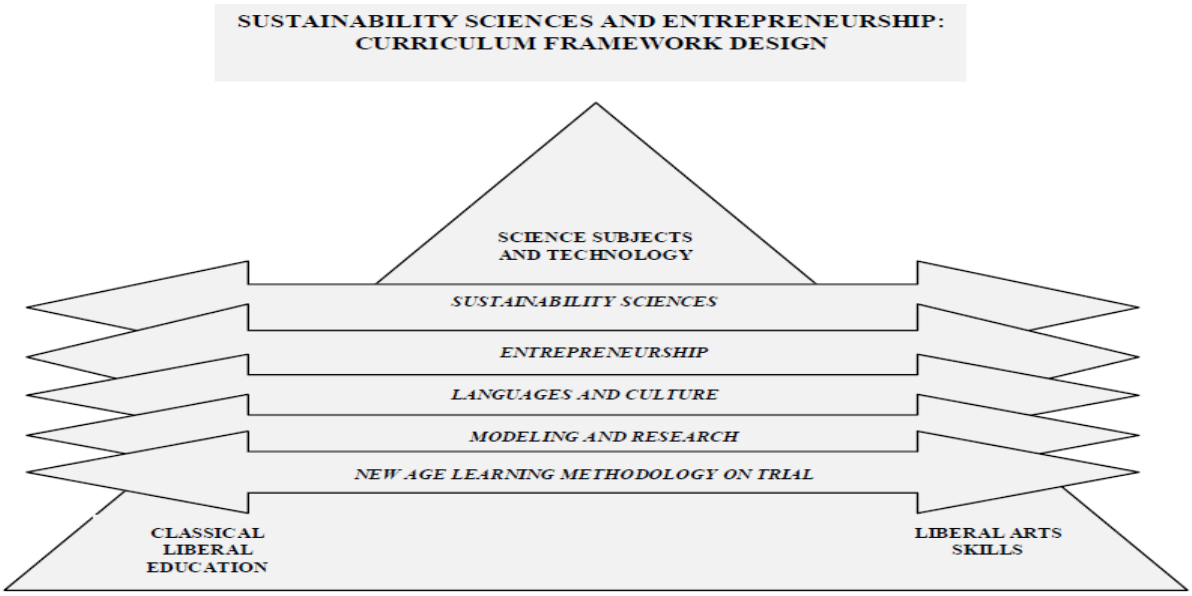

Figure 1. Planned curriculum themes and emphases

That picture will lead to a situation in which management and undertaken cooperative international training programs may lay the groundwork for more open and commensurable curricula and better cross-cultural learning. Also, the "research on demand" design gives access for scholars, teachers, and students to joint work based on all partners' experience. Training for sustainability needs value-based guidelines and strategies in order to be attractive and motivating for high-school and university students. Figure 1 shows how this enterprise planning strategy should be "packaged" into the shape of the "big cultural picture curriculum design". Actually, this design is a combination of old and new. The goal is to guarantee a studying path for the whole youth, for instance through 1) liberal education, the classical path, 2) liberal arts, the skills path, and 3) the science path. These are integrated through horizontal theme studies described by Figure 1.

We do know that students' interest in education is declining and that they are less motivated to learn in formal settings. Thus, we are especially interested in which ways this design may influence the sustainability orientation and awareness among the youth. Students need to exercise their learning methods in active and social learning environment. This means that instead of being concentrated on school subjects, the students are in need of fewer but wider approaches to learning practical, as well as fundamental problems rather than just fragmented pieces of knowledge. This is the very case in demanding sustainability studies – knowledge should be applicable in real life, otherwise our efforts are in vain. Thus, as far as the LCT concept implies radically interdisciplinary learning approach, it also demands a radically different framework within which we have undertaken thinking about curriculum development. Researchers study real interactions and linkages from different perspectives. The fundamental theme to provide practicing of the assumed training for sustainability could be found in Human–Ocean relationships, being the base of global sustainable development[3]. Comparison of such studies demonstrates that the theme of sustainable Human–Ocean System calls for interdisciplinary training which encompasses a practical way of the three dimensions of sustainable development: economic, social and environmental issues. "Land–Ocean Interactions in the Coastal Zone", currently is a core project of both the Global Environmental Change the International Geosphere-Biosphere Programme and the International Human Dimension Programme, having the extensive interests in EU and

[3] Oceanography: an introduction to the marine environment, Weyl P. John Wiley and Sons, New York, 1970

Russia, as well as in China[4]. In this context, the drivers, defined as the primary sources of external pressures on coastal ecosystems, refer to the need for food, space for living, recreation, and other basic needs for social and economic development which are delivered through fisheries, recreational sites, bioremediation of waste, and so on and so forth. The sustainable development of Human-Ocean System is bound up with harmonious relationships between human development and sustaining ecosystem services, and addresses the multiple goals of socio-economic development and environmental sustainability in a synergistic manner, and the latter provide the area for cooperation of the training efforts and the practical oriented research. In place of the old teacher-driven learning practices a view of science curricula as inherently dynamic entities, changing as new data and insights are generated, connected to the inquisitive norms and cultural practices of the scientific enterprise must come. This is related to inquiry based learning approaches [Makitalo-Siegl et al., 2011]. Particularly because of recommendations of Life Cycle Initiative, the outline of the inquiry-based learning workshops is assumed to be implemented in several grades ("middle", "high", "undergraduate", "business") in conjunction with our LCT learning concept which could be introduced by the thematic curricula block in the part "Modeling and Research":

- Carbon Foot-Printing (CFP). This training presents the key steps in CFP, and this training workshop focuses on how CFP can be used to improve the resource efficiency of operations and reduce the carbon footprint, through linking it to energy efficiency;
- Water Foot-Printing (WFP). This training presents the key steps in developing a WFP inventory, focusing on hands-on calculation exercises on water usage, practice training skills, and learn how to facilitate their own trainings;
- Life Cycle Assessment (LCA). This training presents the central messages of LCA in a format accessible to life cycle experts and practitioners, and the training includes: Introduction to LCA and its relation with environmental decision support;
- Life Cycle Management (LCM). LCM aims at minimizing the environmental and socioeconomic burdens associated with product or product portfolio throughout its entire life cycle and value chain. This training includes an introduction how to use LCM and how to communicate on benefits to the presentation of stakeholders` expectations;
- USEtox. The aim of this workshop is to introduce participants to the exposure science methods used in life cycle and comparative risk assessment, which will allow participants to come away with knowledge of basic concepts of exposure science for chemical impact assessment and be able to perform their own assessment using the USEtox model and interpret results;
- Global Guidance. This training provides guidance principles for LCA databases, and this training sets up a bridge between the data users and the data providers, making basic information easily accessible for computing the environmental footprints of materials and products that are key to make and judge green claims;
- Social Life Cycle Assessment (S-LCA). The purpose of using S-LCA is to provide social information for decision making, social information between production and consumption and information for social improvement.

The themes reviewed above provide the framework for the basic SuSki21 [Kankkunen et al., 2013; Voronov, 2013]: (1) resources, (2) production, (3) consumption, (4) utilization; and market specialists: (5) resources market, (6) products (goods, services, technology) market, (7) wastes market. The classroom environment should emphasize active learning through inquiry, problem solving, hands-on activities, and small group projects. Indeed, attitude and meaningful science studies can be employed successfully already at the primary level by using a combination of learning methods that enhance ways of thinking and learning, so SuSki21, such as critical thinking, problem-solving, creativity as well as the use of the tools for working and modes of inference in practice [Kankkunen, 2001; Kankkunen, 2004]. Learners in the middle grade, for example, may primarily interact with the university layer of the LCT environment; they can explore how

[4] Ocean economy, OECD, 2016; Road Map for Marine Market, RF National Technological Initiative, 2016; National Marine Development Planning and China Ocean Agenda in the 21st Century.

small changes in certain parameters affect the impact output, and use the LCT model to learn some basic concepts about sustainability assessments at the Human-Ocean system. Undergraduate and business learners can go more deeply with the market concepts into the scientific assumptions and data that underlie the model's structure. Learners may conduct their own research of the scientific literature and investigate a hypothesis on what a different functional relationship would imply for the value chain as a whole.

TRAINING TECHNOLOGIES FOR COLLABORATIVE INQUIRY-BASED APPROACH

The issues noted above are designed to be supported by the innovative use of different information and communication technology (ICT) applications which might be already in use by students in their leisure time, as well as new applications as the technology develops further. It is important that the group collaborative information seeking and sharing as well as decision-making in groups can be used as a basis for the ICT. The effective approach to the appropriate technologies assumes understanding collaboration as fundamental mechanisms of the adaptation of a man-machine system.

The practical realization of such mechanisms is assumed by the progressive growth of mathematical models and means of automation for searching and sharing information and further utilizing and applying this information. So, ICT will be supported by the following solutions: collaboration at different levels; maintenance of information seeking and sharing processes; maintenance of discussions and negotiations; planning of joint activities; consensus construction and knowledge building. Drawing on a more general framework, a possible model is based on the developments in the area of support processes, such as decision making. The core of the introduced model is the fundamental mode of a multiple criteria choice that starts with the partial order mechanism, being the weakest at the ordering power, towards the linear (strong) order, which is processed under the group aggregation principle that one confirms the innovative prospects for groupware. In the most fundamental way, due the multiple criteria core of LCT, the groupware tools for searching and sharing information, interacting and manipulating data seems to be a valuable ICT technique. It helps learners understand through the hypertext instructions what the data reveals about the working of nature by means of examples closely related to real sustainability problems. In turn, the technology-enhanced collaborative learning environment in special conditions improves significantly the basic cognition processes of the individual person: selectivity of search skills grows, accuracy of subjectively estimated scales is increasing, individual topographical representations are specified, completeness and depth in mastering concepts are improving, etc. Such a system is capable of satisfying the methodological requirements for the prospective technology of learning, being adequate to the practical inquiries of education and learning for sustainability. Moreover, such techniques may be used to support collaborative decision making as well as assisted negotiations. In this way we see the innovative ICT-LCT learning conception for the prolonged “Summer School”, at the levels “middle”, “high”, “undergraduate”, and “business”. Phase_1, e.g., will be concerned about sustainability paradigm and collaborative learning based on the educational versions of the appropriate software (e.g., GREET, SimaPro). Phase_2 will be devoted to the project identification, e.g., by the remote mode. Phase_3 will be realized in annual summer seminars by the project sustainability management, and continued to small and medium business training and consulting. The noted activity illustrates the powerful option at ICT, combined with a group decision-making mode, i.e., the collaborative learning version that enables the interaction, and can lead in-depth science learning towards sustainability and building a bridge between the student and science communities due the Human-Ocean theme.

The experiment for identification of the students’ confidence at sustainability theme could be also undertaken. There are known from publications[5]:

[5] Brundtland, G.H. Report of the World Commission on Environment and Development: Our Common Future. Agenda 2030 for sustainable development.

- "Principles" of sustainability;
- "Activities" in accordance with the noted principles by the themes: "Knowledge", "Attitudes", "Behaviors", or "Economics", "Ecology", "Societal".

The questionnaire is provided by the "statements" which could be "True" or "False" towards the sustainability activities. Assessment in every theme (PSi, i = 1, 2, 3) is made by the rate of the right answers, while the total assessment is PS = PS1*PS2*PS3, being the "Probability of Sustainability" of the sufficient competence of the respondent at the sustainability activities. There is known the "threshold", $PS_0 = 0.47$, i.e., it is the rate, when the mass overcome of which provides the sustainability perspective, and "youth PS" is the youth input to the global inertial mechanism of sustainability development [Voronov, 2015]. In view of the continuous education "youth PS", provided at High School, is mentioned as the initial data at the Higher Education training process for the specialists to be capable to increase the mass rate at the sustainability competence [Kankkunen, et al., 2015; Kankkunen, et al., 2016]. The undertaken theory provides calculations which have showed the prospects for productive cooperation between High School and Higher Education to promote the social progress along the line of "Technology – Industry – Economy" that one needs at least 49% of the young specialists to be trained at "Innovations Management" [Voronov, 2016a; Voronov, 2016b]. It is known[6] that increasing the students` participation in STEM (science-technology-engineering-mathematics) remains a primary component of the policy measures to strengthen education for innovation. And the introduced consequences have been confirmed by the known practicing, e.g. the United States also aims at increasing the number of graduates in STEM fields by one-third, or one million, over the next decade, and it will be provided at the level of 0.49. And the last one confirms the Road Map to move the ideas on ITCS to the reality of the enhanced continuous education system for sustainable development.

CONCLUSION: THE NEW FLY-WHEEL ON SUSTAINABILITY IS NEEDED

William James`s famous metaphor[7] of the enormous fly-wheel of society confirms the self-evident belief in the conservative tradition and its agents to keep "societies in balance". However, James himself continues: "Already at the age of twenty-five you see the professional mannerism settling down on the young commercial traveler, on the young doctor, on the young minister, on the young counsellor-at-law". So, is there actually anything to do, are we doomed to take a one-way downhill ticket? The answer is "no", according to his contemporary, the philosopher Charles Peirce[8]. Peirce continues: "It is catastrophe, accident, reaction which brings habit into an active condition and creates a habit of changing habits". Peirce also reminds us that "every man exercises more or less control over himself by means of modifying his own habits". Apt words, if deeply understood in our times especially if the discussion over sustainability. In this paper, that is why the development of sustainability courses for high-school use is very important: we cannot rely on the old habits any more. We have to believe in "a habit of changing habits". Otherwise, our worst scenario from the educators' point of view could be that the schooling system may become the major fly-wheel to maintain things as they have always been. Preventing this scenario from taking place we could find through curriculum planning a way to protect all that is valuable and sustainable for any nation: environment, culture and a sound economy.

Followed by such ideas, the undertaken life cycle conception provides us with a well-based qualitative and quantitative outlook at "Generation for Sustainability". And, while there is a debate about the testing and measurement of cognitive skills, most parents and policy makers alike accept the notion that cognitive skills

[6] Science, technology and industry outlook, OECD 2014

[7] "Habit is the enormous fly-wheel of society, its most precious conservative agent" James, W. (1950) Principles of Psychology. Vol. 1. Reprint edition. Dover Publications, New York.

[8] "To learn is to acquire a habit. What makes men learn? Not merely the sight of what they are accustomed to, but perpetual new experiences which throw them into a habit of tossing aside old ideas and forming new ones" Peirce C. (1976) New Elements of Mathematics, by Charles S. Peirce. Carolyn Eisele (Ed.). The Hague & Paris: Mouton.

are a key dimension of schooling outcomes. But there comes a question on whether this proxy for school quality (students' performance in standardized tests) is correlated, and if so, then how much it is correlated with individuals' performance in the labor market and the economy's ability to grow. Until fairly recently, little comprehensive data have been available to show any relationship between the differences in cognitive skills and any related economic outcomes. Such analyses generally require tracking individuals over time, a much more difficult data collection scheme. So our approach combined of empirical data ("PS-competence") and the threshold model for sustainability ("LCT-concept") provides innovative and reasonable outlook.

As a continuum, the undertaken LCT approach seems productive enough to clarify the role of educational management and international management integration, based at Finnish-Russian-Chinese cooperation for sustainable development. On the other hand, due to the growth trend of gross ocean product, particularly in China, the undertaken relationship of the training curriculum to the emerging ocean-based industries offer vast opportunities for addressing many of big economic, social and global challenges humankind to face in the years ahead. Since the emerging ocean industries are developing and applying a range of science and technological innovations to exploit the ocean's resources more safely and sustainably, or to make the oceans cleaner and safer and to protect the richness of their resources, the underlined curriculum is strongly desired by prospective practicing. By such approach the SuSki21, being the subject of our design, will be capable to contribute in a meaningful way to global prosperity, human development, natural resource management, green growth and innovations promotion.

Morover, design of the technology for the use of international training, combining opportunity of perspective information engineering and inter-individual dialogue as the factors of activation of the appropriate processes, allows the decision experience on the basis, accepted in the field of systems for group decisions making support. Following such understanding of group effect mechanism in learning, as the cooperation through a system of the psychological factors and pedagogical targets, is the base technological line for ITCS. Such approach to design collaborative inquiry-based learning provides an opportunity to apply existing theoretical development of mutual adaptation in complex systems which promote construction of correct algorithmic means for effective control of such processes.

To conclude, it has been seen that innovative management should act for the benefit of financing, organization, and education technology, including the appropriate curricula. The "feet on the ground" demand here is to find a solution, perhaps by turning illusion into reality to enhance the generation for sustainability. The practical way following our model, is manifested by the entrepreneurial approach for ITCS, i.e. the activity of organizing and managing commercial undertaking which involves market, environmental and social risks. We are developing a new international fly-wheel called "sustainability" for the educational curriculum. It should firmly be installed into the enormous fly-wheel of the global society.

REFERENCES

Kankkunen, M., Makitalo-Siegl, K., & Voronov, A. (2013). 'Towards generation for sustainability: Illusion or reality?, in Issa, T. et al. (Eds.), Proceedings of the International Conference on Sustainability, Technology and Education (STE 2013), IADIS Press, pp.45-52.

Kankkunen M. (2001) Concept mapping and Peirce's semiotic paradigm meet in the classroom environment', Learning Environments Research, Vol. 4 No. 3, pp.287-324.

Kankkunen M. (2004) How to acquire ‖the habit of changing habits‖: the marriage of Charles Peirce's semiotic paradigm and concept mapping', in Canas A.J. et al. (Eds.), Concept Maps: Theory, methodology, technology. Proceedings of the First International Conference on Concept Mapping, Vol. 1, pp.375-383.

Kankkunen M. (2010) How to do more with less – an entrepreneurial Municipality Approach in Etela-Savo, the Center of Knowledge and Innovation Research (CKIR), Aalto University School of Economics, Finland.

Kankkunen, M., Makitalo-Siegl, K., & Voronov, A. (2015) LCM2015 Life Cycle Modeling for Threhold Rate of Sustainability Skills and its Applications. www.lcm2015.org

Kankkunen, M., Timofeev, F. (2016) Investment efficiency at the skills of 21-st century – preliminary review on Finnish and Russian experience at the economics of education, in "Modern management: problems and prospects". St.-Petersburg, UNECON, 2016, pp. 131-142.

Makitalo-Siegl, K., Kohnle, C. and Fischer, F. (2011) Computer-supported collaborative inquiry learning and classroom scripts: Effects on help-seeking processes and learning outcomes, Learning and Instruction, Vol. 21 No. 2, pp.257-266.

Voronov A.A. (2011) Resource management stability: outlook on issues and analysis. Paper Presented at the Life Cycle Management Conference (LCM2011), 28-31 August 2011. Berlin, Germany.

Voronov A. (2012) Stability management at life cycle of automotive production. Vestnik ENGECON, technical sciences, pp. 108-112.

Voronov A., Gridneva V. (2013) Training for engineering sustainability. Vestnik ENGECON, technical sciences, pp. 72-78.

Voronov A. (2015) Consumption and production sustainability management: modeling and analysis, in "Industrial management", St.-Petersburg, UNECON, 2015, pp. 57-68

Voronov A. (2016a) Management for innovations at education: modeling of economic processes, in "Modern management: problems and prospects". St.-Petersburg, UNECON, 2016, pp. 151-156.

Voronov A. (2016b) Review on the modern technologies. St.-Petersburg, UNECON, 2016, 54 p.