Creating and testing educational theories and methods to promote Education for Sustainable Development: OECD/ENSI in Finland from 1997 – 2004
A poster and handout in the thematic SEED/OECD/ENSI conference
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Since 1960s I have followed international development of Environmental Education and tried to apply the best parts of it to my own life. From 1970s as a university teacher I developed own theories and own methods on basis of the best earlier one's I had found. In 1992 I created a research group of EE. In 1997 our group had a possibility to join OECD/ENSI project. It was made possible by Professor Peter Posch, who had in 1996 participated an international conference (Northern Call for the Environment), which we had arranged in Finland at University of Joensuu, Savonlinna Campus. We have always wanted to learn from the best of each field, and in many ways OECD/ENSI was and is one of the best in the world. Learning from the best is an aspect of my high quality learning. Another aspect of it is meaningful learning. I visited in 1993 at Cornell University, USA, to study it and Vee heuristic, practice of them and their theoretical underpinnings for three months. Still another aspect of high quality learning is to construct own tentative theories on basis of the best earlier ones, to explicate them, to test them both theoretically comparing them to other theories and empirically in own practice. For all these purposes our research group has found concept mapping and Vee heuristics useful tools.

I have developed theories of Sustainable Development, integrating education, and high quality learning. Methods I have developed in cooperation with my research group include design experiments, integrating action research, an improved method of concept mapping, and an improved method of Vee heuristic. My research group has been tested them both theoretically and empirically since 1992. Ms. Vuokko Vienola was the first to have her PhD thesis in 1995. Mr. Markku Kankkunen had his PhD thesis in 1999. After that the following persons have had their PhD theses: Mr. Raimo Pitkänen 2001, Ms. Ilona Wilska-Pekonen 2001, Ms. Pirjo Äänismaa 2002, Ms. Kaija Salmio 2004 and Ms. Vuokko Ahoranta 2004. Together from my research group seven doctoral theses have been successfully constructed.

In 2004 I was nominated as the first full professor of Biology and Sustainability Education at Unversity of Helsinki, which is one of the ten leading research universities in Europe. I developed a new approach to Education for Sustainable development. I integrated my theory of Sustainable Development with theories of different capitals (natural capital, social capital, human capital etc.), and Professor Robert J. Sternberg's balanced theory of wisdom, and accompanying theories of creativity and successful intelligence. This project of my research group for the UN Decade of Education for Sustainable Development 2005 – 2014 has been accepted into the Forum on Science and Technology for Sustainable Development, based at Harvard University, USA.
http://ksgnotes1.harvard.edu/bcsia/forum.nsf/proj/culturallysd
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Some of the main ideas and tools are presented in the following figures.

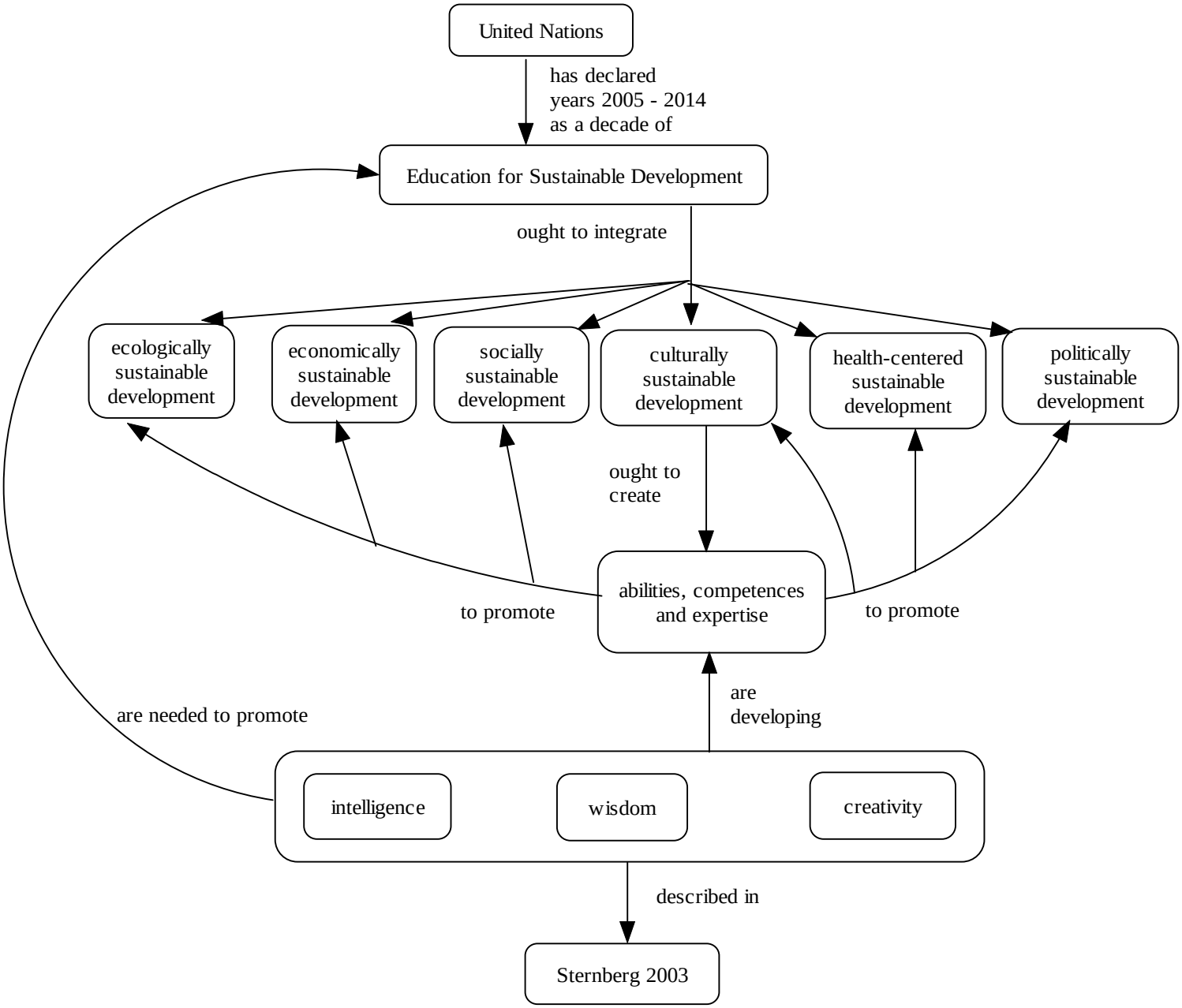

FIGURE 1. A theoretical framework for our research project to promote the UN Decade of Education for Sustainable Development (2005 – 2014). The original figure was created by Professor Åhlberg in June 2004 during his visit at Yale Univesity, USA. This project has full support of Professor Robert J. Sternberg and his research group at Yale University, USA. More international partners would be welcome.

The Figure1 shows only the main ideas what is needed to promote sustainable development in education. These ideas are more elaborated in the Table 1.

Aspect of sustainable development	**Form of capital (accumulated work)**	**Interests which ought to be balanced applying Sternberg's balanced theory of wisdom**
1) Ecologically sustainable development	Natural capital, accumulated "work" of Nature, work of ecosystems and resulting free services: cleaning of air, and water, food, raw materials, biodiversity etc.	Nature's interests, interests of life, ecosystems, biodiversity, protection of nature, management of nature
2) Economically sustainable development	Monetary capital, financial capital: Infrastructure, houses, factories, roads, money etc.	Interests of global, regional and local economy, interests of households, interests of quality of life for individual and societies
3) Socially sustainable development	Social capital, social networks, family, friends, humankind, all who share increasing and accumulating win-win thinking and acting	Interests of individuals, families, societies and humankind for good life
4) Culturally sustainable development	Cultural capital, in a new and broader sense: everything worthwhile that individuals, societies, organizations, nations and humankind have learnt during history, including all developing abilities, competence and expertise, intelligence, creativity and wisdom. Cultural capital in this sense includes intellectual capital, creativity capital and a part of human capital.	Cultural interests, interest for education and learning, developing abilities, competence and expertise, intelligence, creativity and wisdom
5) Health-centered sustainable development	"Health capital" is an important part of human capital which ought to be taken care of. Good health is requirement for all other forms of human capital.	Health interests, interests for obtaining and maintaining optimal level of health individually and socially, nationally and for humankind
6) Politically sustainable development	Trust capital, political capital, e.g: Representatives of nations have signed many agreements to promote sustainable development. They have promised to promote it. If the nations, municipalities, organizations and individuals do not act as they have promised and agreed on, then they lose credibility, their trust capital, political capital.	Political interests, individual and group interests to promote common good as they understand it. Interest for obtaining and maintaining credibility, trust.

Table 1. How different aspects (components) of sustainable development are related to different forms of Sustainable Development according to Åhlberg (June 2004).

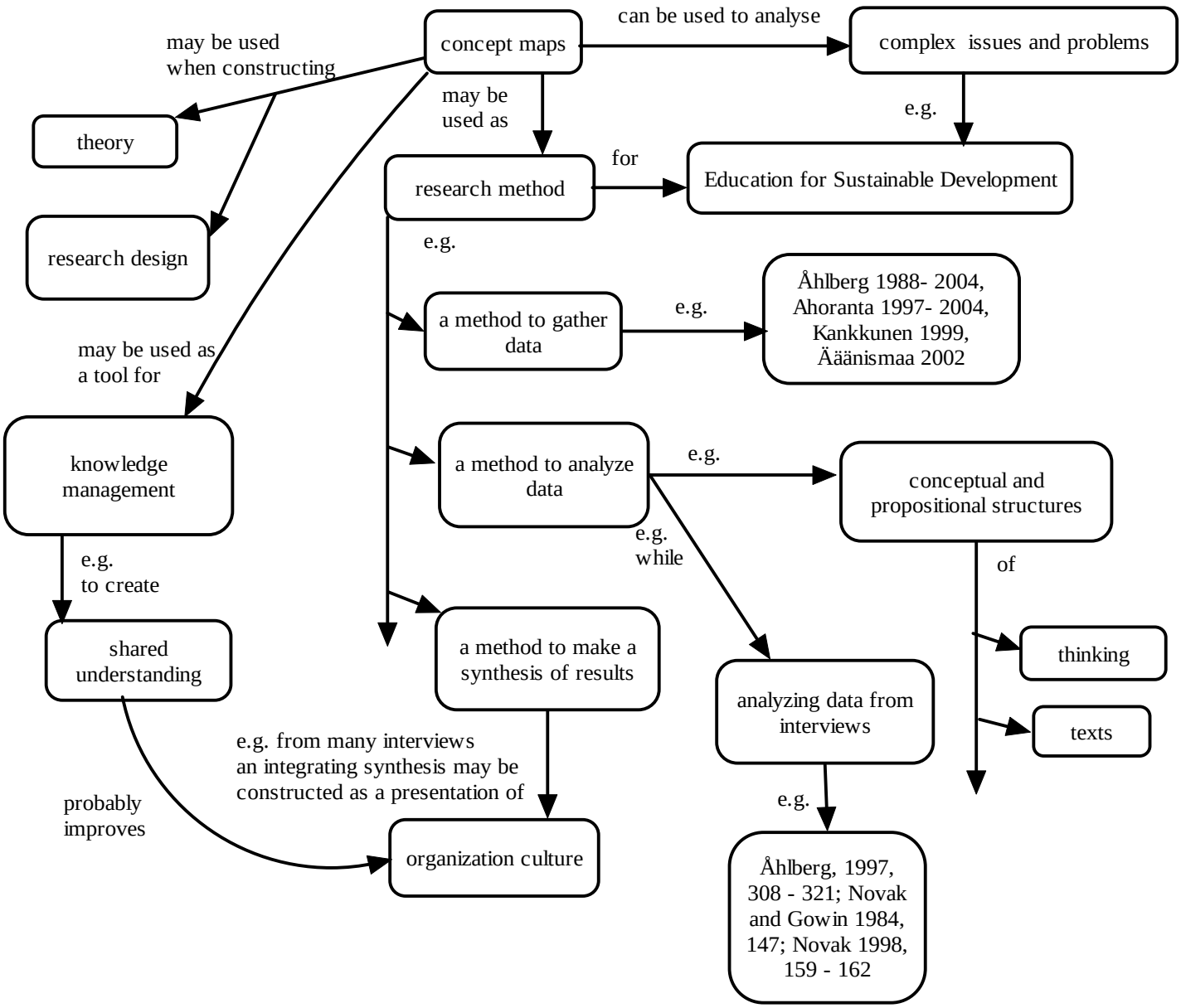

FIGURE 2. A concept map of concept mapping as a versatile tool for research.
The most central concepts of this concept map based on the number of links with other concepts are ' concept maps' and 'research methods' both of which have five (5) links with other concepts.

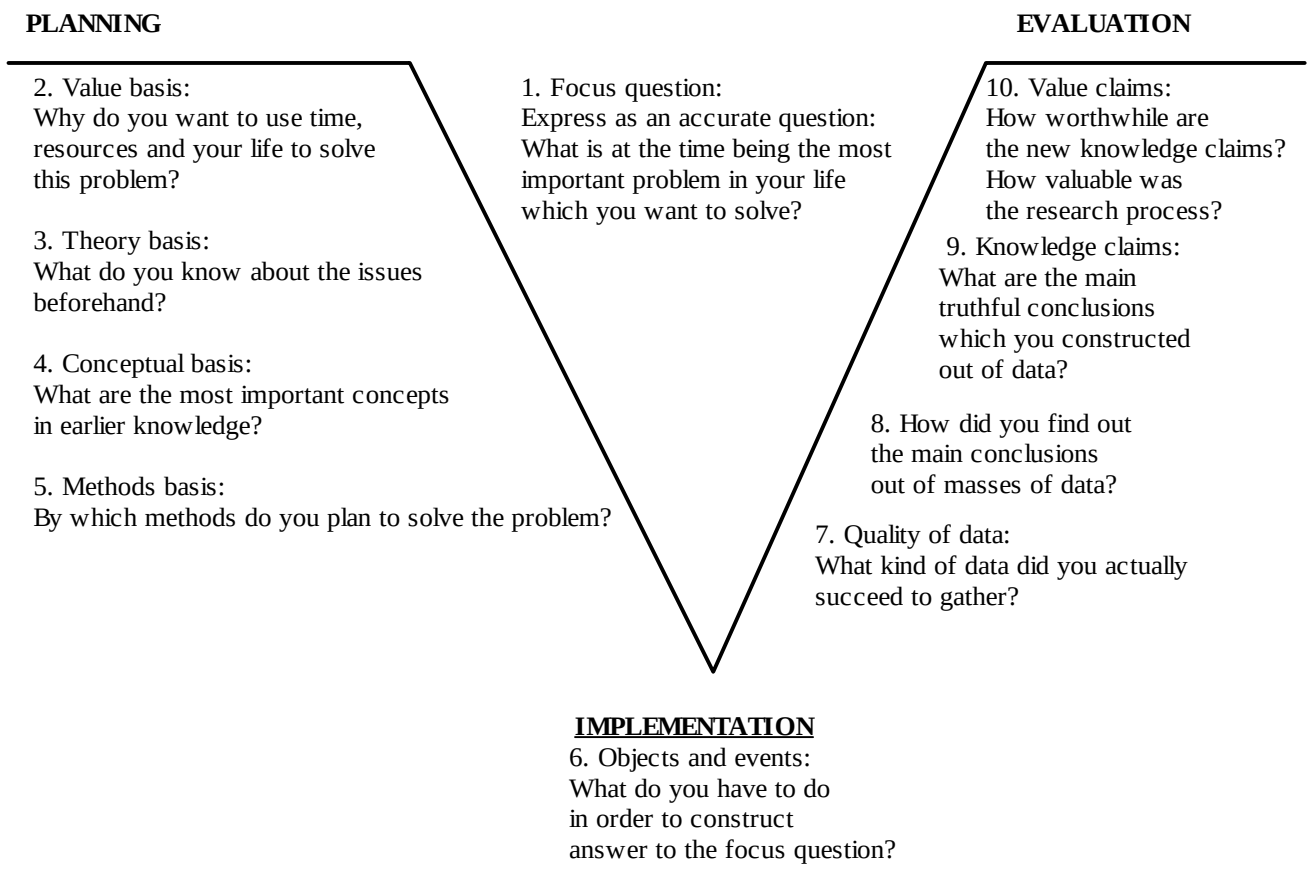

FIGURE 3. Ten basic steps of the improved Vee heuristic. Steps 3 and 4 may be replaced by the first concept map. Steps 8 and 9 may be replaced by the second concept map. This tools requires pupils, students, teachers and researchers to reflect values at the beginning and at the end of each learning and research project.

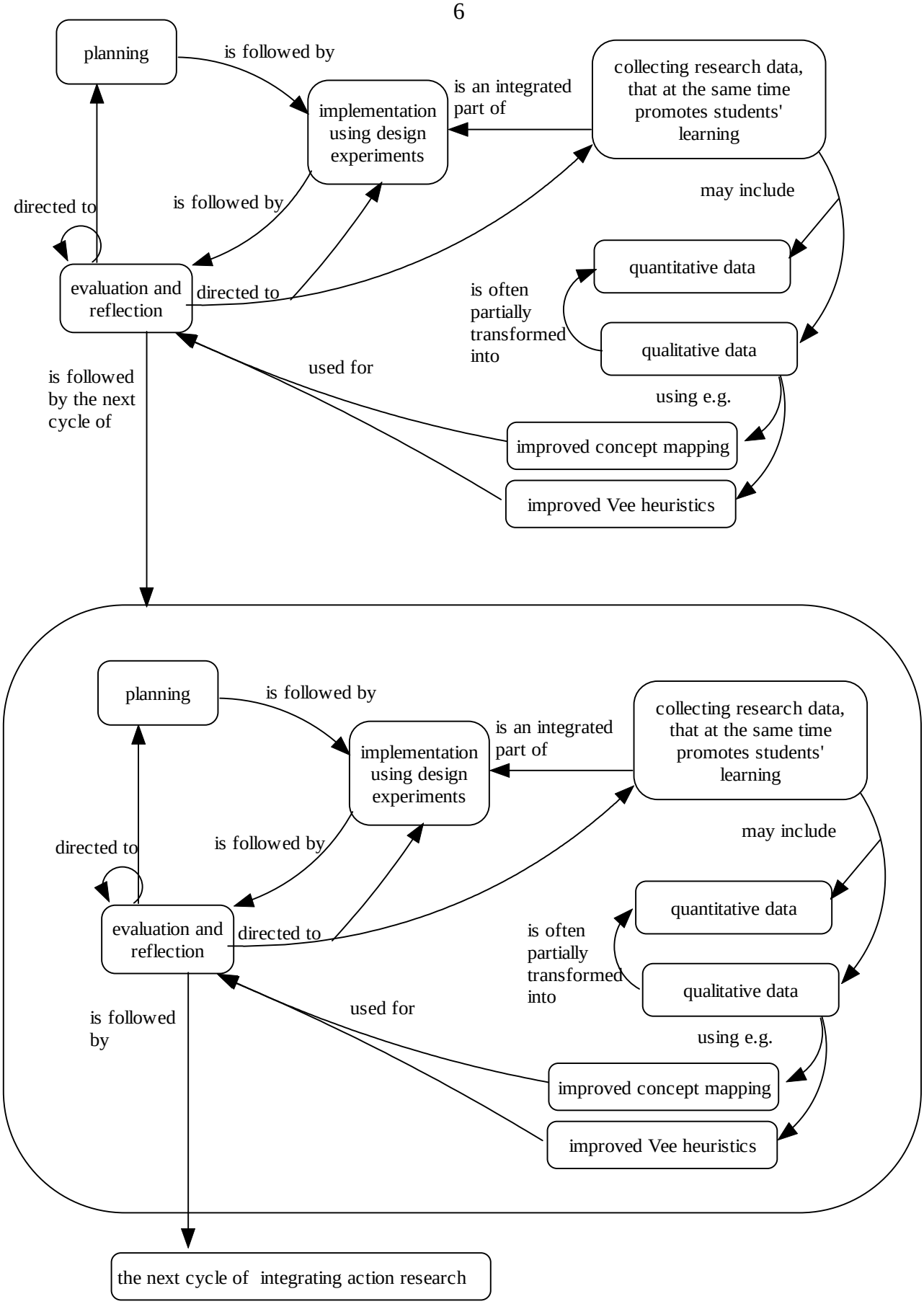

FIGURE 4. Main ideas of integrating action research as a concept map. Originally Åhlberg (1994) developed the basic strategy, which has since then tested empirically in many doctoral theses.

Collaborative knowledge building as one of the main building blocks of the fourth phase of OECD/ENSI project in Finland

Since the year 2000 we have experimented with collaborative knowledge building using Knowledge Forum®, a leading edge computer program developed for it. In 2000 I visited three times at University of Toronto, Canada, to learn the method and its theoretical underpinnings from its developers professors Carl Bereiter and Marlene Scardamalia. We have mixed results after using the program for five years. Occasionally the use of it may be very rewarding. For most participants it has been too time consuming.

Active participants of OECD/ENSI/SEED/FINLAND research group include:

Ms. Vuokko Ahoranta, Ms. Annukka Alppi, Ms. Mervi Heinonen, and Ms. Arja Kaasinen.

Critical friends include:

Dr. Lea Houtsonen (National Board of Education, FINLAND)
Dr. Taina Kaivola (University of Helsinki, FINLAND)
Prof. Patrick Dillon (University of Exeter, UK)
Prof. Michael Reiss (University of London, UK)

Litterature

ÄÄNISMAA, *P.* 2002. *Ympäristökasvatusta kehittämässä kotitalousopettajien koulutuksessa* [Researching and developing a university course in teacher education by integrating action research and collaborative learning; in Finnish]. Doctoral dissertation. *Publications in Education no. 74*. Joensuu: University of Joensuu,

ÅHLBERG, M. 1993. Concept maps, Vee diagrams and Rhetorical Argumentation (RA) Analysis: Three educational theory-based tools to facilitate meaningful learning. Paper presented at *The Third International Seminar on Misconceptions in Science and Mathematics, August 1- 5, 1993, Cornell University*. http://www.mlrg.org/proc3abstracts.html.

ÅHLBERG, M. 1998. Education for sustainability, good environment and good life. In Åhlberg, M. & Leal Filho, W. (Eds.) *Environmental Education for Sustainability: good environment, good life.* Frankfurt am Main: Peter Lang, 25–43.

ÅHLBERG, M. 2001. Concept mapping as a research method. www.metodix.com/showres.dll/en/metodit/methods/metodiartikkelit/kasitekartta_tutkimusmenetelmana/.

ÅHLBERG, M. (2002) *Suomentajan jälkisanat: Eheyttävän kasvatuksen teorian, käsitekarttojen ja Vee heuristiikan käytöstä sekä tutkimus- ja kehittämistyöstä Suomessa* [Twenty years research on theory of integrating education, improved concept maps and Vee heuristics in Finland; in Finnish]. In Novak, J. Tiedon oppiminen luominen ja käyttö [Finnish translation of Joseph D. Novak's (1998) *Learning, creating and using knowledge*] (pp. 300–315). Jyväskylä, Finland: PS-kustannus.

ÅHLBERG, M. 2003. Tutkimus ympäristökasvatuksen, leirikoulutoiminnan ja yleisemminkin kestävää kehitystä edistävän kasvatuksen laadun varmistajana ja kehittäjänä. [Educational research promotes quality assurance and continual quality improvement in education for sustainable development, in environmental education and in resident outdoor education.] In Lovén, L. (toim.- ed.). 2003. Ympäristökasvatus - Environmental Education. Seminaari Kolin kansallispuistossa 18.-19.4.2002. Proceedings of the Seminar at Koli National Park in Finland 18.-19.4.2002. Metsäntutkimuslaitoksen tiedonantoja 887. Finnish Forest Research Institute, Research Papers 887, 19 - 32.

ÅHLBERG, M. 2004. Concept mapping for sustainable development. A paper presented at The First International Conference on Concept Mapping, Public University of Navarra, Spain. September 14 – 17, 2004.

ÅHLBERG, M. & AHORANTA, V. 1999a. Good practice in EE needs good theories and tools - systemic research and a success story in Finland. Poster and a handout in OECD/ENSI strategy workshop FROM THE PILOT TO THE MAINSTREAM: generalization of good practice in international environmental education. December 9 - 12, 1999, Hadeland, Norway.

ÅHLBERG, M. JA AHORANTA, V. 1999b. Improved qualitative ways to monitor and promote high quality learning. Paper presented at the eighth EARLI Conference in Gothenburg, Sweden, August 24 -28 1999.

ÅHLBERG, M. & AHORANTA, V. 1999c. High quality learning, thinking and acting in EE at primary school level – an integrating theory and a case study. Roundtable presentation and a handout at the Annual Conference of AERA, April 19 – 23, 1999, Montreal, Canada.

ÅHLBERG, M. & AHORANTA, V. 2002. Two improved educational theory based tools to monitor and promote quality of geographical education and learning. *International Research in Geographical and Environmental Education, 11*(2), 119–137.

ÅHLBERG, M. & AHORANTA, V. 2004a. WHAT DO CONCEPT MAPS REVEAL ABOUT PUPILS' LEARNING AND THINKING? Paper presented at the annual conference of NARST (National Association for Research in Science Teaching), April 1–3, 2004, Vancouver, CANADA.

ÅHLBERG, M. AND AHORANTA, V. 2004b. Six years of design experiments using concept mapping - at the beginning and at the end of each of 23 learning projects. A paper presented at The First International Conference on Concept Mapping, Public University of Navarra, Spain. September 14 – 17, 2004.

ÅHLBERG, M., ALPPI, A. & HEINONEN, M. 2003. How to promote Education for Sustainable Development and Environmental Education by integrating action research and design experiments. A poster and handout from University of Joensuu in Savonlinna, Savonlinna Department of Teacher Education to SEED (School Development through Environmental Education) NETWORK. Presented at the OECD/ENSI/SEED Thematic workshop and COMENIUS 2 contact seminar on "Innovation in Teacher Education, the potential of Action Research and Environmental Education" in Szeged University, Hungary, September 4 - 7, 2003

ÅHLBERG, M. & HEINONEN, M. 2004. Professori Peter Poschin merkitys kansainväliselle OECD/ENSI - ympäristökasvatushankkeelle ja sen Suomen osaprojektille [The importance of Prof. Peter Posch for international OECD/ENSI project and its Finnish part project]. In Mietola, R. & Outinen, H. (toim.) Kulttuurit, erilaisuus ja kohtaamiset Kasvatustieteen päivien 2003 julkaisu. Helsingin yliopiston kasvatustieteen laitos. ISBN 952-10-1621-3, http://www.helsinki.fi/ktl/julkaisut/ktp-2003/osa5.pdf

ÅHLBERG, M., ÄÄNISMAA, P. & DILLON, P. 2005. Education for sustainable living: Integrating theory, practice, design and development. Accepted to be published. Scandinavian Journal of Educational Research 49(2).

ÅHLBERG, M. & DILLON, P. 1999. Materials for Constructivistic Environmental Education, mainly to be used in pre-service and in-service teacher education: An integrating approach to environmental learning. In De Paz, M. & Pilo, M. (Eds.) 1999. European Project for Environmental Education. A Curriculum for European Schools. Genoa: University of Genoa, Italy, 3 - 33. [Published partly digitally: http://www.fisica.unige.it/~ilgioco/progetto/ahlberg/ahlberg/ahlberg.html]

ÅHLBERG, M., KAASINEN, A., KAIVOLA, T. & HOUTSONEN, L. 2001. Collaborative knowledge building to promote in-service teacher training in environmental education. Journal of Information Technology for Teacher Education 10(3), 227 - 238.

ÅHLBERG, M., TURJA, L. & ROBINSON, J. 2003. Educational research and development to promote sustainable development in the city of Helsinki: Helping the accessible Helsinki Programme 2001–2011 to achieve its goals. *International Journal of Environment and Sustainable Development, 2*(2), 197 - 209.