Enhancing ICT competence of teachers in the SADC region through innovative learning & knowledge communities

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I. BACKGROUND AND SIGNIFICANCE OF THE STUDY

Overcoming poverty and exclusion of developing countries cannot succeed through direct financial and technical assistance of the industrialized countries alone. It is likely to be more effective to provide developing countries with tools and instruments that help themselves build individual and collective capacities and cultivate individual and collective agencies needed for social and cultural renewal and productive participation in global economy. In this regard, improving the quality of education has a central role. Many developing countries in the Southern African Development Community (SADC) region are following industrialized countries in efforts to restructure their educational practices through utilising the potential of Information and Communication Technologies (ICTs).\(^1\) It is expected that ICTs will improve quality of learning, motivate students, allow them to exercise complex skills needed in future, make extended knowledge resources of the Internet accessible to them, and, thereby, facilitate the development of agency needed for mastering the future.

Teachers, school administrators, and students from SADC countries are very excited about the new learning resources provided by ICTs. They work, however, under extremely difficult conditions. Sometimes there are 100 not-too-well-fed and restless students in a classroom without electricity or air conditioning. If there is a decent classroom, HIV-AIDS, other diseases, malnutrition, and various socio-economical disadvantages make learning objectives sometimes very difficult to attain. There is moreover a huge shortage of competent teachers throughout the region. The situation is exacerbated by the poor salaries of teachers. It takes an extraordinarily motivated teachers to elicit in-depth learning under these conditions. Nevertheless, some SADC countries are investing resources to equip schools with computers, to build information networks and other infrastructure needed for knowledge society. Experiences world-wide indicate, moreover, that the mere introduction of ICTs is likely to make working with more complex educational objectives available for the participants. Simultaneously, there are enormous obstacles before the digital divide is overcome and Africa has an adequate ICT infrastructure.\(^2\)

Because developed countries benefit from ICTs, they should engage in partnerships with developing countries.\(^3\) The Finnish government has made rather substantial contributions to that effect through a number of projects with an ICT component. For instance, the SCOPE project\(^4\) in the Republic of South Africa (RSA) addressed the issue of implementing and enhancing the use of ICT in schools in the Provinces of Mpumalanga and Northern Cape. The Finnish development policy has been in the process of being realigned in order to better take into account the phenomenal penetration of ICTs and the economic and social implications stemming from that. The national information society strategy and system of innovation have been scrutinised in order to harness them in support of the national development policy.\(^5\) South Africa and the SADC region have been in focus of this realignment of the Finnish development policy. The SADC-Finnish ICT project\(^6\) can be seen from this perspective as an early experiment in enhancing the IC technology transfer. The next phase has been

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1 Bose, 2004; Bose & Tsayang, 2005; Humna, 2005; Ramharai & Goodoory, 2003; Senteni, 2005.


6 The SADC-Finnish ICT project (2002-2004) aimed at developing the web services of SADC.
investigating and building collaboration networks between information society technology (IST) developers in Finland and in the SADC region. One of the pilot projects has been the SADC Teacher Training Project Enhancing ICT competence of teachers in the SADC region through innovative learning & knowledge communities. The current proposal at hand is a direct continuation of this project.

I.1. Accumulating data on international experiences in building a knowledge society

The project team has extensive experiences from Finnish educational technology projects in the Helsinki area, on the national level as well as from European educational technology projects. The experiences indicate critical issues to be addressed when engaging in major restructuring of educational practices through ICTs. One such lesson is the need to address both teachers' technological and pedagogical support for using ICTs in teaching and learning. Without addressing pedagogical challenges, it is possible that the use of computers simply leads to extensive copying and other superficial activity rather than thoughtful learning, task-oriented engagement, learner-directed and collaborative inquiry processes. Also common is to locate computers in single classrooms controlled by technologically oriented teachers making it difficult for others' access to them. The corresponding issues are addressed in sophisticated teacher training programs going on in Africa.

These experiences may provide useful lessons for developing countries that could help them to avoid the greatest pitfalls and biases. However, many experiences cannot directly be transferred to developing countries because a) there is a shortage of resources, b) the scale of technology investment is smaller, c) technologies and software applications have dramatically changed in the last 10 years, d) and the national cultures, pedagogies, curricula and traditions are different. In order to find productive ways of integrating ICTs with national educational strategies of SADC countries, the implementation has to be grounded in local and national pedagogical traditions, values, curricula, practices, and needs. Brown and Duguid (2001) pointed out that ICTs “bite back” if they are used only according to technological considerations. Nardi and O’Day talked about information ecologies, indicating that the use of ICTs has to support the needs of local communities rather than emerge only through technical considerations. Productive ways of using ICTs emerge through coevolution of technologies and pedagogical and knowledge practices.

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7 The contribution of the Finnish Government to the IST development in the RSA and the rest of the SADC region have been channelled so far through the Finnish Embassy in Pretoria utilising so called Local collaboration funds. The next phase in cases with sufficient prerequisites will be consolidating the projects through seeking funding from appropriate research or development sources.

8 The project coordinated by the Lifelong Learning Institute Dipoli (TKK Dipoli) of Helsinki University of Technology aims at developing the capacity of Southern African teachers in using ICT. It has been implemented so far through a series of workshops started in May 2005 in Botswana, setting up a support website in Mauritius and a network of innovative knowledge sharing communities of teacher trainers and teachers in Botswana. In addition to the best practice teachers’ in-service training for ICT capacity building the project is applying the change laboratory method developed in the Centre for Activity Theory and Developmental Work Research in University of Helsinki and in Virtual centre for Innovative Learning Technologies (VCILT) in University of Mauritius.


12 Unwin, 2004; 2005.


I.2. Change Laboratory: Providing Local Communities Tools for Mastering Educational Transformations

The proposed project focuses on integrating ICTs in education in three SADC countries by means of change-laboratory methodology. This methodology relies on theoretical and methodological tools provided by the Cultural-Historical Activity Theory\textsuperscript{15} (CHAT) that simultaneously address individual and social transformations. The theory of the ‘activity system’ (Figure 1) is based on a few central points: the object-orientedness of human activity, mediation through cultural-historically developed tools of intelligent activity, and contradictions emerging between the elements of activity systems. This perspective focuses on examining reciprocal relations and interdependence between individual actions and collective activities. It conceptualizes and identifies the crucial variables in the process. A collective activity has its own motive under which individual actions are subsumed and which they serve according to division of labour and communal rules.

![Figure 1. A model of the activity system (Engeström, 1987)](image)

A special value of the activity theory is in parallel conceptualization and constructive facilitation of social transformations. From the perspective of CHAT, introduction of ICTs in education provides novel resources for educational transformation by changing the structure of teachers’ and students’ activity. When a group starts to use new ICT-based tools or instruments, all other elements of the prevailing activity system change as well. By engaging the participants themselves in reflecting on changes, they can be helped to master their own activity transformation. This is likely to empower educational experts of developing countries and to help them plan how to integrate ICTs in their curriculum and everyday activities.

Based on ideas of CHAT, Change-laboratory (CL) is an already well-defined intervention method to support organizational and social transformations.\textsuperscript{16} In CL sessions, participants construct shared understanding of their reflections (‘reflection-on-action’). This takes place by engaging the participants themselves in analyzing disturbances and ruptures developing within a community. These are assumed to represent deeper contradictions between the elements of a system, and support the community’s learning potential. In CL interventions, besides communities reflecting upon their prevailing practices, they analyze the historical development of their current activity system, as well as envision and implement the scenarios of future activities\textsuperscript{17}. The reflections evoked by CL are trigge-

\textsuperscript{15} Engeström, Miettinen, & Punamäki, 1999.

\textsuperscript{16} Ahonen, Engeström, & Virkkunen, 2000.

\textsuperscript{17} Virkkunen, Engeström, Helle, Pihlaja, & Poikela, 1997.
red by researchers’ intervention and preliminary interpretations by showing the participants a “mirror” of their work. The data from the process are based on articulations, reactions, and reflections and lead to knowledge advancement for construction of new practices.

I.3. Introducing Change Laboratory Method in a Developing Country

The present research network demonstrated the feasibility of the change-laboratory method for supporting educational transformation within a developing country as part of SADC teacher training project described earlier. A one-week training session was organised for 60 teachers and head teachers in Botswana in November 2005. Experiences of development projects indicated that there needs to be sufficient representation from educational institutions as well as from various levels of administration. The participants worked as school-based teams and established regional networking during the workshop. Moreover, there was a strong representation by Botswana’s Ministry of Education and the University of Botswana so as to mobilize national efforts to support the initiative.

Figure 3. Elements of a change laboratory meeting. Change laboratory is an intervention method that involves sustained efforts in analyzing and transforming social practices. It comprises a series of workgroup meetings to reflect on current practices and envision future activities. Essential aspects of change laboratories are a) using videotaped practices as a “mirror” for assessing current activity, b) generating ideas and tools (e.g., charts) that help to assess past, present and future activity, and c) modelling present practices by using activity-system analysis. Archives and libraries may assist the workplace community in analysing historical development of its activities.

During the week, the participants were trained in various aspects of using ICT in education and engaging in planning corresponding to school development efforts. Rather than providing direct guidance on the use of ICTs in Botswana schools, the change-laboratory method invited the participants to design how to use ICTs. The teams analyzed their prevailing activity system, how it had evolved, challenges and tensions emerging from the use of ICTs, and external pressures emerging from the changing world. Each school constructed its own pilot plan for the subsequent three months, involving concrete exploration of ICT-related pedagogical changes (novel rules, new collaborative partnerships, and changed division of labour). Appendix A presents modelling examples created by local participants in change-laboratory workshop (Team B).

18 See page 4.

During the workshop, the participants were provided concise descriptions of experiences of educational technology projects from industrialized countries. Videos and short descriptions served as “mirroring” materials that help the participants to relate their own challenges with experiences from other countries. Hands-on activities and experiences from applying the concepts and methods to solve local educational challenges helped to concretize concepts and appropriate the method.

Currently, the participants are pursuing their school projects, and most of them are very motivated to continue the present initiative. They are accumulating experiences concerning how to meaningfully integrate ICTs with their educational practices. Many teachers are pursuing shared activities during which ICTs are used to support students’ inquiries. In order to be able to utilize their collective experiences, the participants will, however, need new workshops during which to share and reflect on their accomplishments. The project team has committed itself to continue this effort, and will organize a similar series of training workshops and interventions in Mauritius starting in April 2006, as the Mauritius extension part of the project.

II. FRAMEWORK, AIMS AND METHODS

II.1. Key Aspects of the Proposed Project

The purpose of the present investigation is to facilitate as well as to document and assess educational transformation in the three SADC countries: Botswana, Mauritius and RSA. The project will be carried out in its initial phase by organizing in each of the countries, two workshops similar to the one described above. In the first workshop, the change-laboratory method is introduced, skills and practices of using ICTs in an educational setting strengthened, and school-based and regional pilot projects designed. Local graduate and doctoral students will collect ethnographic data (video and audio taped participant observations) concerning selected schools and projects. This will take place under supervision of the joint research project team consisting of members from Finland and the SADC region. Samples of the video data will be used as mirroring material while experiences of ICT projects are assessed in the second workshop. The workshops themselves will be recorded, together with interviews of selected key actors. Moreover, meetings, email discussions and other relevant activities of the present research network will be recorded for research purposes. The data are analyzed in the context of cultural historical activity theory.

II.2. Distributed Computer-Support for Local Change Laboratory Processes

An essential aspect of the present project is to develop Distributed Change Laboratory (DCL) tools that allow the participants (teachers, school administrators, local and international investigators) to share their experiences between physical meetings (technological development activity is separately funded). Alain Senteni’s research unit has developed open-source-based DCL tools. Components of these tools will be utilized in creating corresponding tools within the framework of the European Community’s Knowledge-Practices Laboratory (KP-Lab) project that is coordinated by Hakkarainen’s research centre at the University of Helsinki. It is a large integrated European project (11.2 million euro, Information Society Technologies program, Technology Enhanced learning call) that involves 15 European countries and 22 organizations (2005-2010). The project will produce a modular, flexible and extensible system consisting of a cluster of inter-operable applications (i.e., shared collaborative spaces, semantic web knowledge services, communication platforms, ubiquitous user agents, inter-institutional access) which organize participants’ collaborative activity around
shared knowledge artefacts. One key aspect of the learning environment is the development of Change-Laboratory Tools that support professional communities in making visible, reflecting on, and transforming their knowledge practices. The programme will be based on open source technologies available free of charge. Separate funded technology development allows the present investigators to research and develop software tools than are specifically tailored to the needs of SADC teachers, provided that the present project is funded. Moreover, it appears possible to engage teachers from SADC region in an open software development community regarding the DCL tools as well as KP-Lab environment. While the KP-Lab project did not originally involve participation of developing countries, implementation of the present research project would allow co-configuration of KP-Lab technologies according to the emerging African needs.

II.3. Research Aims

1. The proposed project has a number of methodological objectives. It aims at producing data concerning applicability of the change-laboratory method for supporting educational transformations associated with ICT in developing countries. The problems address how the change laboratory method supports educational transformation in developing countries. What kinds of tensions and challenges emerge in change laboratory process? How can the method be adapted to various local needs and preferences? How would one create a general instrument to support transformation that communities can use on their own?

2. The main aim of the present project is to produce scientifically valid data concerning the nature and context of ICT-related educational transformations in SADC countries. Such data, being rigorously collected, will provide a basis for genuine knowledge advancement in the field. While interventions considering implementing sustained changes highlight teachers’ role as change agents, other actors of the activity system count; students have to become motivated and committed; head teachers, local, regional and national school administrators will need to be aligned to support transitional efforts. Rules and regulations that come from outside of the school constrain transformation of educational practices. Consequently, it is essential to investigate relations between educational transformation and the constraints that larger social structures entail. The study will explore the following questions: What objectives do the participating teachers and students try to accomplish by integrating ICTs with their practices of learning and instruction? What challenges and constraints emerge while trying to use ICTs to improve the quality of learning and teaching in SADC? Answers to these questions will help us to make knowledge-based inferences about what kinds of local, national, and international resources would be needed for overcoming the obstacles.

3. The typical form of Change laboratory relies on a physically present community. Simultaneously, it is possible to create virtual, ICT-based tools that facilitate various aspects of change laboratories. Intelligent support may especially be needed when pursuing change-laboratory interventions in remote communities without direct support from more experienced interventionists. These tools enable the users both to pursue change-laboratory processes and share their reflective processes with other communities and participants. Accordingly, the present project aims to examine, what kind of virtual change-laboratory tools are needed to support educational transformation efforts both locally and over a distance, both synchronous and asynchronous.
II.4. Research Methods

The most important method of the present project prescribed change laboratory (CL) process that allows local communities to reflect on their present practices as well as engage in deliberate design of ICT-transformed practices. The present investigators will organize in each country (Botswana, Mauritius, and RSA) two one-week change-laboratory workshops during which the participants analyze the current activity systems and their history, as well as plan changes that arise as a consequence of starting to use ICTs.

In order to assess the extent to which prevailing practices of learning and instruction change, the present researchers are going to do ethnographical participant observations in several schools. We will pay attention to the features (variables) and component processes of transformation, according to the theory. We will observe and videotape several regular and computer supported classes following procedures that have earlier been used in international OECD studies regarding ICT in education.\(^\text{20}\) In addition, we will interview a sample of teachers, head teachers, school administrators as well as students regarding the role of ICT in learning and associated pedagogical practices. Various data (students’ productions, teachers’ pedagogical designs) concerning ICT-based study project will be collected and described. Further, a sample of teachers will be asked to keep a diary concerning ICT-enhanced study projects they are organizing. Qualitative content analysis will be used to assess both interviews and diaries. Data collection will also take place through teachers’ participation in DCL (and in corresponding KP-Lab activities). The applicants have already begun to develop the protocols for analyzing such data.

III. RESULTS

III.1. Expected Results and Their Significance

The present project will produce scientifically sound data, and knowledge concerning applicability of CL methodology for facilitating educational transformation in developing countries linked with their starting to use ICTs. The proposed investigations will help to specify challenges and constraints regarding ICT-related educational transformations, and, thereby, assist in designing new interventions. Further, the project will produce information concerning current practices of learning and instruction in schools in the SADC region.

III.2. Application and Utilization of Results

Change laboratory involves a structured method of intervention; consequently, the resulting data, rigorously collected and properly analyzed, are the basis for advances in scientific knowledge. Such knowledge is not only academically interesting, but will also assist other developing countries in pursuing corresponding educational improvements through ICTs. Moreover, the present investigation will contribute to the advancement of Botswana’s, Mauritius’ and South Africa’s own multidisciplinary research network concerning ICT-based educational transformation. Beyond strengthening our own research network, we will create an international network of teachers and principals for supporting, creating and building of a global knowledge society. Further, we will have a scientific understanding of the process of such creation.

III.3. Publications and Dissemination of the Results

The results of the present project will be published in a series of symposiums and conference presentations (e.g., AAA, AERA, CSCL, EARLI, ICLS, IFIP) as well as scientific articles. We will produce one co-edited book regarding how to support ICT-based educational transformations by change-laboratory interventions in developing countries as well as a guidebook concerning change-laboratory intervention. The results will be disseminated through national and regional conferences and workshops in the SADC region and IFIP’s WITFOR conference at Addis Ababa in 2007.

IV. RESEARCH NETWORK

IV.1. The project team’s earlier work in the area

The project team represents multi-disciplinary expertise concerning educational and professional transformations. It has an extensive background in pursuing educational technology projects in the SADC region (Nleya, Senteni, Sinko), investigating the use of ICTs in learning and instruction and supporting corresponding educational transformations (Hakkarainen, Sinko), carrying out change laboratory interventions (R. Engeström, Virkkunen), and investigating professional development, innovative knowledge communities, and associated collective transformations (all applicants). The following publications indicate central aspects of our competence related to the proposed project:

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IV.2. Participating organisations

• **The Center for Activity Theory and Developmental Work Research**

The Center is an independent research unit in the Department of Education, University of Helsinki. It has a multidisciplinary paradigm based on Cultural-Historical Activity Theory. The Center was awarded the status of National Center of Excellence during the period 2000–2005. It has an interdisciplinary doctoral program with more than 30 full-time graduate students. Prof. Jaakko Virkkunen leads the Center’s research sector called “New Forms of Transformative Agency”. He belongs to the group which created and formulated The Method of Change Laboratory. His current research projects concern the development of a new kind of WEB-based collaboration of developers and HRD units involved the development of a new operating concept for organizational activity. Dr. Ritva Engeström leads the Center’s research sector called “Collaboration between School and Work: Work and Science from the Viewpoint of Transfer and Boundary Crossing”. She has conducted several Change Laboratory projects in health care and school education. Besides the developmental contents, her research interests center on the theoretical and methodological questions on collaboration between academic researchers and practitioners, and the researcher’s role in utilization of research outcomes.

• **The Centre for Research on Networked Learning and Knowledge Building Department of Psychology, University of Helsinki**

Kai Hakkarainen’s background is in psychology and cognitive science. He has extensive experience regarding research and development of computer-supported collaborative learning as well as investigating and supporting educational transformations taking place while starting to use ICTs. He participated in Botswana workshop and will be centrally involved in investigating the pedagogical effects of change-laboratory interventions. Since 1997, Hakkarainen’s research group has achieved a nationally and internationally recognized position in socio-cognitive research on computer-supported collaborative learning in Europe. Starting from practically oriented research funded by municipal school administrations, we have become a highly regarded research unit in Finland and in Europe in respect of high international publication volume. The centre was responsible for pedagogical evaluation of the Helsinki City Educational Technology project (1996-2001) as well as that of Espoo (2001-2005). It has conducted 8 European research projects including CL-NET, ITCOLE, CELEBRATE, and P2P. It coordinates the Knowledge-practices Laboratory (KP-Lab) project.

• **Lifelong Learning Institute Dipoli (TKK Dipoli), Helsinki University of Technology**

TKK Dipoli has vast experience in participating international research and development projects in the area of lifelong learning, e-learning, organizational capacity building and professional competence development, technology foresight. Currently TKK Dipoli is coordinating three projects with RSA, the SADC teacher training project, which this proposal at hand is based on, the sInfoSoc project aiming at networking South African and Finnish universities interested in the IST development. Mr. Matti Sinko is the project manager of the current SADC ICT Teacher training project 2005. He is responsible for R&D and the pedagogical support units of TKK Dipoli. He has a strong background in promoting ICT based social innovations world-wide, most recently having worked in the headquarters of SADC 2002-2004 as a large scale SADC-Finnish ICT project manager.
• **The Virtual Centre for Innovative Learning Technologies (VCILT), University of Mauritius**

Professor Alain Senteni is the Director of VCILT and the Chairman of the Lifelong Learning Cluster (LLC). His current work regards the integration of ICTs in educational systems of developing countries, with an emphasis on intervention strategies, training and ICT-based development. VCILT has an extensive experience implementing Computer mediated communication and pedagogies. Particularly, the object of VCILT is to enhance the interplay between pedagogical and technological innovations, such as Collaboration and Learning management systems, and Learning object repositories. VCILT participates in organizing national and regional workshops concerning ICT in education. Graduate students of VCILT will have a central role in collecting data from local schools, including interviewing teachers, head teachers, and students as well as videotaping regular and computer-supported classroom lessons.

• **University of Botswana**

Professor Paul Nleya will participate in organizing national and regional workshops concerning ICT in education. His graduate students will have a central role in collecting data from local schools, including interviewing teachers, head teachers and students, as well as videotaping regular and computer-supported classroom lessons.

• **University of Cape Town (Republic of South Africa)**

Dr Joanne Hardman took part in Botswana workshop in November 2005. She is a lecturer at University of Cape Town. Her areas of interest include learning and cognition and technology, and learning/teaching of maths. She investigates the creation of technological 'spaces' for mediating engagement with academia and understanding the impact of technology on children's cognitive development. Her PhD study, supervised by Paula Ensor (UCT) and Harry Daniels (Birmingham University), uses activity theory to investigate how teachers mediate mathematics to underprivileged grade 6 students using computer soft-/hardware.

• **Advisory Unit: Computers in Education, UK**

Principal consultant Mike Aston will participate in teachers’ ICT training during the proposed project. He has truly exceptional experience in the field, having years of experience of training teachers in countries such as Vietnam, Uzbekistan, Kuwait, and Botswana. Advisory Unit is functioning in United Kingdom, and was founded in 1968. It supports schools and colleges in developing the implementation of ICTs in teaching and learning. Over the last 37 years, the staff of the Unit has engaged in many research projects, for example: The Hertfordshire Computer Managed Mathematics Project; The Impact of ICT on students' achievement; Effective Teacher Training models; The G8 Report on ICT in schools (a longitudinal study); National ICT impact indicators (in conjunction with UNESCO); Assessment and co-ordination of ICT in schools. Advisory Unit has over the years had strong links with Kings College, London University and the University of Hertfordshire.
• Finnish Collaboration

The present project involves collaboration between the University of Helsinki and Helsinki University of Technology. Hakkarainen’s research unit is involved in MOBILE project coordinated by Teemu Leinonen, Medialab, University of Arts and Design Helsinki. The project involves facilitating collaborative learning by using mobile tools at South African schools. The present researchers will, further, collaborate with Mikko Korpela, University of Kuopio, a Research Director of the Healthcare Information Systems R&D Unit, University of Kuopio, Finland. He is member of IFIP WG 9.4 and 8.2, and was organizing the first Health Informatics in Africa conference HELINA’93. He was a co-chair of the WITFOR2005 Health Commission. Currently he heads health information systems research projects with Nigerian, Mozambican, South African and Chinese partners. In addition, we have strong ties with various national institutions working with educational technology and workplace research.

• International Collaboration

The present research network already represents actually implemented international research collaboration. Each institution has strong national, regional, and international connections with other academic research institutions. A large number of highly regarded research institutions are involved in the KP-Lab project closely associated with the present one. Innovative knowledge communities are investigated with Carl Bereiter and Marlene Scardamalia (Institution of Knowledge Innovation and Technology, University of Toronto) and Sten Ludvigsen (Intermedia, University of Oslo). Cultural psychological aspects of the present project are supported by our collaboration with Michael Cole (The Laboratory for Comparative Human Cognition, University of California, San Diego).

V. TIMETABLE OF THE STUDY

The present project will start in the latter part of this year, through other funding sources to maintain the already gathered momentum in Botswana during the introductory phase of the project in 2005, main activities taking place in 2007. During that year, the applicants will organize one workshop in Botswana and two workshops in Mauritius. Simultaneously, we will prepare initiation of corresponding activities in South Africa through several visits so as to align sufficient local resources for supporting the intended education intervention.

The proposed project is part of a larger set of activities growing out of the collaboration of the organisations and individual researchers and practitioners. The initial phase, the preparatory work in 2005, including the series of workshops, has been funded through a grant from the Embassy of Finland in Pretoria and the World Information Technology Forum (WITFOR) 2005 organising committee of the International Federation of Information Processing (IFIP). The participating organisations, Helsinki University of Technology, University of Botswana, University of Helsinki and University of Mauritius have also allocated funds and made contributions in kind to cover all the costs (including work) of their staff contributing to the project during 2005.
V.1. Specific Justification of the Research Funding Applied from the Academy of Finland

Funding of the present pilot project would enable continuation of the present investigators’ efforts for supporting ICT-based educational transformations in the SADC region. Botswana teachers and schools are engaged in intensive pilot projects in difficult conditions, during which they implement computer-supported changes in their practices of teaching and learning. They will need extended pedagogical, methodological, and theoretical support of the present investigators. Valuable experiences of Botswana have to be utilized by extending the project to Mauritius and RSA. Through adequate funding to support these activities, we will be able to collect and analyze data following scientific protocols, and publish it in journals in the field of education. Funding of the present project would also lead to tailoring of a major European open-source software development initiative (KP-Lab) to answer to the emerging needs of African societies.

V.2. Graduate and Post-graduate Training in the Frames of the Study

An important focus of the present preliminary investigation is to create conditions for doctoral training at national and international levels. A group of students from universities of Botswana, Mauritius and Cape Town (RSA) will be integrated with the present project through virtual and physical meetings in collaboration with professors Senteni, Nleya, and Hardman. A major part of research data will be collected by local graduate and doctoral students. The present research network will support students from SADC region in their effort to enter into doctoral studies in Finland. This will take place by means of helping them in making the Marie Curie and other grant applications.

VI. REFERENCES


Appendix A

Modeling examples created by local participants in change-laboratory workshop (Team B, Northern Region of Botswana); a) Applying expansive learning cycle to analyze challenges of implementing computer-supported instructional practices; b) Analyzing the effect of ICTs in transformation of school’s activity system

Expansive cycle of learning

1. Need state / ethnography
   - Identification and analysis of constraints:
     - Shortage of competent ICT staff
     - Shortage of ICT equipment
     - Relevant software
     - Computers
     - Projectors
     - Networking
     - Lack of funds
     - Lack of commitment-ministry
     - School heads and teachers
     - Vandalism: Teachers and students
     - Maintenance ICT implements
   - By solving the constraints the Northern region would have designed a new model of activity. This explains how we wish to execute our pursuits?

2. Analyzing contradictions
   - A clear plan of implementation will be drawn discussed and implemented at cluster and school levels
   - The Northern region started by identifying the need, which was the best possible way of gradually infusing or integrating ICT into our instructional or pedagogical pursuits

3. Designing a new model
   - By reflecting the process teachers can learn about this developmental activity and change or vary it to meet their instructional needs

4. Examining the new model
   - We will pilot the use of ICT in our instructional pursuits through its gradual infuion into selected school subjects.
     - E.g. Geography / social studies etc

5. Implementing the new model

6. Reflecting on the process

7. Consolidating the new practice

The activity system

ICT IMPLEMENTS
ICT SKILLS
CHANGE LAB
CHANGE OF MINDSET

Instruments:
- tools and signs

ICT INTEGRATION
ACROSS THE CURRICULUM

CITIZENS WITH
HIGH LEVELS
OF ICT LITERACY

MINISTRIAL AND
SCHOOL LEVEL
COORDINATION
(CDNE, DEPT SEC, SMT)

TEACHER/
STUDENT
MANAGEMENT

TEACHERS

A. TIME TABLING (COMPUTER LAB)
B. TEACHING LOADS
C. OTHER COMPUTER REGULATIONS
D. POLICIES

PROVIDERS OUTSIDE THE SCHOOL
- PTA
- POLICY MAKERS
- MOE DEPARTMENTS e.g. TT&D AND DNFE

MINISTRIAL AND
SCHOOL LEVEL
COORDINATION
(CDNE, DEPT SEC, SMT)