Asia-Pacific Journal of Cooperative Education

Essay

Cooperative Education Interventions Aimed at Transferring New Technologies from a Developed to a Developing Economy: Germany/South African Collaboration in the Automotive Industry

George De Lange
Department of Cooperative Education, Port Elizabeth Technikon, Private Bag X6011, Port Elizabeth, South Africa

Received 16 October 2001; accepted in revised from 19 March 2002

South Africa, like many other developing countries is facing the consequences of globalization. Globalization represents a significant challenge for the Republic. In this article three models of intervention that seek to transfer technologies from a developed to a developing country are described. The author suggests that these models provide a working infrastructure for the exchange of students between two countries and significantly advances students' understanding for both technical and non-technical skills (*Asia-Pacific Journal of Cooperative Education, 2002, 3(1), 13-17)*.

Keywords: South Africa; Germany; globalization; international exchange

Globalization can be described as the increasing integration of various sectors in today's world resulting from the revolution in communication technology and progressive lowering of trade barriers ("Globalization", 2001, June 7). Its most striking aspect is the way big companies have now become international rather than national role players within a global economy and seem to have more power than some governments in the countries they operate in. Big multi-national companies account for about a fifth of world output and 70 percent of global trade ("Globalization", 2001, June 7). The economic gap between developed economies and developing economies has grown much wider as a result of globalization. In 1960, the average per capita gross domestic product in the 20 richest countries in the world was 15 times that of the poorest 20. Today with globalization the economic gap has widened to 30 times, because the richest countries have on average, grown much faster than the poorest ones. Much of this disparity is often blamed on large multinational companies ("Globalization", 2001, June 7).

With South Africa's emergence from political and economic isolation since 1994, its economy has not remained immune from the effects of globalization (Department of Labour [DoL], 2000). The inability of certain industries to remain competitive in the worldwide market has resulted in their closure and increasing levels of unemployment in South Africa. This is particularly evident in the shoe, clothing and textile industries situated in the Eastern Cape and Western Cape Provinces of South Africa.

Currently South Africa has a poor record in terms of international competitiveness. The World Competitiveness Yearbook (2000), ranks South Africa (the only African country to be included) at 42 out of 47 countries in terms of economic literacy, education, unemployment, skilled labor, and availability of information technology skills (DoL, 2000). Some of the challenges facing South Africa as a developing country are evident on examination of the education and employment statistics for the adult population: some 38% of which are unemployed, 30% are employed in unskilled work, 24% of adults are semi-literate and under-educated, and 22% are trained as technicians, management or professionals (Wood, 1999).

Globalization has lead to a demand for higher-level skills and techniques. Technological developments and dramatic changes in the accessibility of information have led to a demand for these high level skills in the manufacturing sector of the South African economy. During the period 1970 – 1998 high skilled jobs have increased by nearly 20% in South Africa (Yadivalli, 1999). During the same period the number of unskilled jobs decreased by similar proportion and this trend is expected to continue. Structural changes to the South African economy have also led to less reliance being placed on industries based on agriculture and mining with growth taking place in the manufacturing and financial sectors (DoL, 2000).

Correspondence to: George De Lange, email: george@petech.ac.za

Collaborative Partners

Academic partners
Ingolstadt University of Applied Sciences (Germany) and the Port Elizabeth Technikon (South Africa).

Industrial partners
Audi (Ingolstadt) and Armstrong Hydraulics (Port Elizabeth, South Africa).

Phase I (1999)	• First exchange of undergraduate South African Mechanical, Industrial and Electrical Engineering students to Ingolstadt University of Applied Sciences. • Exchange of undergraduate German students in Business Engineering to Port Elizabeth Technikon. • Tuning of courses and syllabi aimed at offering combined credits acknowledged. • Start of multi-media activities. Target of student exchange program (up to the year 2000 – 25 students in total)
Phase II (2000)	• Integration of local industry (Audi and Armstrong Hydraulics) for internships and industrial projects. • Common supervision of final diploma- and master thesis agreed on between the Port Elizabeth Technikon and Ingolstadt University. • Founding of Verein zur Unterstutzung von Studienaufenthalten in Ausland (VUS) in Germany. A society aimed at funding South African students studying in Germany. • Carrying out of common research activities with emphasis on Computer Aided Draughting and Manufacturing Engineering. • Exchange of academic staff (short term visiting lectureships).
Phase III (2001)	• Exchanging postgraduate students and visiting lecturers. • Planning of combined Masters degree program in manufacturing engineering with automotive industry based research projects. • Introduction of a combined credit-point-system for exchange students at the two institutions.
Phase IV (2002)	• Implementation and start of Masters programs. • Awarding of a combined international degree in automotive manufacturing engineering offered by the two educational institutions. • Exchange of academic staff (long term visiting lectureship).

Figure 1
Model for academic/work exchange placement program

The Port Elizabeth Technikon is situated in the Eastern Cape Province, which is one of the poorest provinces in South Africa. With a population of 6.3 million in 1996, the illiteracy rate in the province is the highest in the country (57%). According to the Port Elizabeth-Uitenhage Socio-Economic Development Monitor [PEUSEDM] (1998), the total number of people who are unemployed and under-employed (i.e., people in the informal and marginal sectors) constitutes 55% of the possible labor force, with only 45% being employed in the formal sector such as factories, shops, services and state departments.

In the context of this scenario, the effects of globalization are expected to further marginalize developing economies due to their lack of competitiveness. The intervention recommendation proposed by the South African Poverty and Inequality Report [SAPIR] (1999) highlighted the important role the transfer of technology can play towards transforming South Africa into an internationally competitive country. This paper provides an outline of three cooperative education models (Figures 1-3), which have been successful in transferring new technology to the automotive industry, which forms the backbone of the Eastern Cape economy. It provides employment to close to 380 000 people (PEUSEDM, 1998). It is estimated that 2.3 million people are dependent on the motor industry for a livelihood.

Since 1998, huge foreign investments have been made into the automotive industry in the Eastern Cape, which has resulted in a number of export contracts being awarded to motorcar and component manufacturers situated in the region. These contracts were dependent on the local automotive industry meeting international quality standards, optimizing production processes with regard to their economy and consideration of the environmental impact.

Collaborative Partners (Consortium Members)

Academic partners
The South African partners are the Port Elizabeth Technikon, Eastern Cape Technikon, East London Technical College. The German partner is Fachhochschule Osnabrück University of Applied Sciences.

Government partners
German Federal Government, Lower Government of Saxony, the Provincial Government of the Eastern Cape Province of South Africa and Carl Duisberg Gessellschaft (CDG), a funding agency.

Industrial partners
Automotive and automotive component manufacturers in Germany and South Africa, which include amongst others Audi, Hella, Volkswagen and Daimler Chrysler.

- Recruitment and selection of electrical, mechanical and industrial engineering graduates and diplomandi and residing in the Eastern Cape Province of South Africa.
- Selection panel consisting of representatives of the above collaborative partners.
- In order to qualify students must have completed at least one year's industrial experience and be a graduate or diplomate from the Eastern Cape Province.

- Students attend 5 month German Language and culture course at Port Elizabeth Technikon, presented by lecturers appointed by the Carl Duisberg Gessellenschaft.
- Students leave for Germany and attend 1 month German Language Course at Saarbrücken Reception Centre, specifically aimed at orientating students to German culture and labor legislation.

- Students attend lectures in manufacturing engineering for a period of 4 months at the University of Osnabrück in Lower Saxony.
- The students are exposed to the automotive industry for 2 months in Germany.
- The students then return to University of Osnabrück – 2 months of lectures on quality, technical and business management in industrial enterprises.
- The students then undertake project work and practical training using new technologies for a period of 2 months at University of Osnabrück.
- The students are then placed at participating automotive and automotive component manufacturers for a further two months of industrial exposure. The student' return home to the Eastern Cape, South Africa.
- Presentation of projects and report back to South African Members of consortium.
- Students are assisted by the South African members of the Consortium to find permanent positions in automotive industries, situated in the Eastern Cape Province.

Figure 2
Consortium placement program

Cooperative education, with specific reference to experiential learning, has proved amongst a number of other strategies to be an effective method for the transfer of the technological expertise required to meet international manufacturing standards in the automotive industry.

The experiential learning models that were chosen took cognizance of the successes and failures of previous experiences with international placements. The lack of success with previous attempts as described by Van der Schyff (2000), results from the following factors:

1. The ability of students to speak a foreign language.
2. The lack of placement opportunities available in English speaking countries. The countries that were most approachable for exchanges were German, French, Dutch and Far East countries.
3. South Africa's geographically isolated position in relation to the developed economies.
4. The high cost of South African students studying at foreign institutions as a result of a devalued currency. The South African Rand lost 35 percent of its value to the dollar in 2001 ("Rand Plunges", 2001, Dec. 3).
5. The lack of state and provincial funding to educational institutions for setting up the necessary support systems and infrastructure required for exchanges, for example the services of an international office.
6. Individual students placed with foreign employers often under-performed as a result homesickness

and a lack of understanding of for example foreign corporate culture.
7. Due to the short history of South African overseas placements, students could not follow in the footsteps of previous students.
8. The portability or acceptability and relevance of South African academic programs in developed countries made it difficult to combine programs and offer common credits.

Cooperative Education Interventions

In this section an outline is provided of three cooperative education models that have been used by the automotive industry (Figures 1-3). Specific attention is given to attendance patterns of experiential learning programs.

Three German–South African experiential learning programs have proven to be successful tools for the transfer of new technologies to the automotive industries in the Eastern Cape Province. As a result of collaboration amongst the Port Elizabeth Technikon, the Eastern Cape Technikon, German Educational Institutions, such as the Ingolstadt University of Applied Sciences, the German Government and the local automotive industry, support strategies for maintaining the experiential learning models were developed. The three models used are described by Reeve (1998) as:

1. Academic/Work Exchange Placement
2. Consortium Placement
3. Branch Location Placement.

A brief outline of the structure and advantages of these models is now provided.

The first model (Figure 1) falls into the *Academic/Work Exchange Placement* model of international placement models described by Reeve (1998). In addition to the model allowing for customization of academic programs and work-based experiential learning opportunities in the automotive industry, other advantages as explained by Reeve (1998) are that:

1. Tuition fees are wavered, which means that exchange students only pay registration fees at their home institution.
2. As a result of a supportive infrastructure and exchanges of groups of students, it reduces homesickness, assists with orientation, the understanding of organizational culture and the transition from academic institution to the workplace.
3. During their period of academic study, students are available for pre-placement activities and interviews.
4. Since the students' status is established as an exchange student, work permits are easier to obtain.

The students placed in industry are equipped to:

1. Assist in setting up and maintaining new technology in the automotive industry.
2. Analyze and optimize automotive manufacturing processes with regard to their economy, quality standards and eco-efficiency.
3. Develop as managers within the automotive industry.

The advantages of using the *Consortium Placement* approach (Figure 2) were that:

1. The formalized structure, which consisted of a number of collaborative partners, was more successful in obtaining funding from foreign governments (Lower Government of Saxony) and funding organizations (Carl Duisberg Gessellschaft).
2. As a result of the team approach with a team leader, the students support each other during the program.
3. The 5 month German language and culture course in South Africa and the one month German course at the reception center in Germany allows for easier 'settling in' of students in a foreign environment.
4. The consortium's networking and leverage ability has greater success in developing placement opportunities.
5. The employers deal with one placement officer at the University of Osnabrück.
6. Due to the strict selection criteria used for students on the program, employer participation is increased.

The advantages of using the third, *Branch Location Model* (Figure 3) model are:

1. Students from South Africa are set technology transfer projects they have to present on their return.
2. Admission to the program, the placement, the monitoring and the reporting procedure are formalized which allows for better quality control. The students are channeled on a specific career path at Volkswagen.
3. It allows for better scheduling of trainees between the mother-plant and branch locations and students are assured of meaningful placements.
4. One 'clearing-house' does the selection and placement of students ensuring that students meet standards set by Volkswagen South Africa and Germany.
5. Operational sections within both branches of Volkswagen can co-ordinate projects between themselves.
6. Students placed overseas already have an understanding of the organizational culture of Volkswagen and easily cope with the transition to the foreign workplace.

Collaborative Partners

Academic partners
Port Elizabeth Technikon and Fachhochschule Braunschweig / Wolfenbüttel, Volkswagen Coaching Company (Wolfsburg).

Industrial partners
Volkswagen of South Africa (Uitenhage – South Africa and Volkswagen Germany (Wolfsburg).

- South African students complete two-year theoretical component of a three-year course in Mechanical, Electrical and Industrial Engineering at the Port Elizabeth Technikon.
- German students complete a two-year theoretical component of four-year course in Business Engineering at Fachhochschule Braunschweig / Wolfenbüttel.

- South African students are placed at Volkswagen South Africa for the first 6 months of the required year of experiential learning.
- Students with the potential of becoming permanent employees of Volkswagen are selected for a further 6 months training.

- Selected students are exchanged between Volkswagen South Africa and Volkswagen Germany, all expenses paid by Volkswagen.
- South African students are exposed to new technologies in automotive manufacturing at the motherplant in Wolfsburg and have to investigate specific projects that they have to report on when they return to South Africa.
- German students undertake course related project work for six months in South Africa. On return to Germany they continue with their final year of theoretical studies at Braunschweig Wolfenbüttel.
- South African students returning to South Africa take up position in their area of specialization at Volkswagen South Africa.

Figure 3
Branch location placement program

7. Technology is transferred to the local branch without disruption to permanent staff.
8. Serves as a recruiting tool for the appointment of permanent staff.

The three models have provided a working infrastructure for the exchange of students between South African and German educational institutions and participating employers. The experience gained by students participating in these exchanges has not only contributed to their technical skills but also to the acquisition of the non-technical skills required by employers of entry-level engineering students.

The students report that the experiential learning programs as applied in the three cooperative education models, contributed towards the development of their non-technical skills which include amongst others communication, teamwork, organizational effectiveness and leadership, information management and creative thinking and problem-solving skills.

References

Department of Labour. (2000). *Towards a national skills development strategy: Skills for productive citizenship for all*. Cape Town: Government Publisher.

"Globalization – the effects on developing economies." (2001, June 7). *Eastern Province Herald*, p. 8.

Poverty and Inequality in South Africa.)1998). Report prepared for the Office of the Executive Deputy President and the Inter-Ministerial Committee for Poverty and Inequality. Available from (http://www.undp.org.za/docs/pubs/poverty.html)

Port Elizabeth – Uitenhage Socio-Economic Development Monitor (1998). *Annual report*. Port Elizabeth, South Africa: Vista University.

"Rand plunges against the dollar." (2001, Dec. 3). *Eastern Province Herald*, p. 11.

Reeve, R. (1998). *A guide for developing international cooperative education programmes*. Boston, MA: World Association for Cooperative Education.

United Nations Development Programme – South Africa. (1998). *Poverty and inequality in South Africa* (URLhttp://www.undp.org.za/docs/pubs/poverty.html

Van der Schyff, G. (2000, April). *International linkages – global training*. Paper presented at the national conference of the South African Society for Cooperative Education, Durban, South Africa.

Wood, G. (1999). Innovative job creation blueprint. *Project report* (pp. 7-19). Greville Wood Development.

World Competitiveness Yearbook. (2000). Laussanne, Switzerland: International Management Development Center.

Yadivalli, L. (1999). Global competitiveness: SA hangs in there. *Productivity, July/August*, 3.