Teaching rural technology: Would the Vigyan Ashram model work in South Africa?

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Abstract

The Vigyan Ashram was set up outside Pune, India to teach rural technology to school dropouts. Its founder, Dr. Shrinath Kalbag, believed that a relevant curriculum and a situated learning approach could turn these 'failures' into successful entrepreneurs. Since it's origin in 1983, the Ashram's graduates have set up over 800 small enterprises including poultry farms, manufacturing, construction, computer services, tailoring and communication kiosks. Students at the Ashram have been responsible for a number of innovations, including a low-cost mini-tractor; low-cost, earthquake-proof construction methods and computer software.

Students complete a Diploma in Basic Rural Technology over one year. Students live and study at the Ashram and are expected to do contract work for the local community to fund their expenses. The Ashram raises funds by providing services such as Internet, soil analysis and equipment repairs to the local community. This paper reports on a visit to the Ashram by a team from Monash University.

The model of the Ashram has appeal for South Africa where there is a need to teach students skills that can lead to self-employment. This is particularly important in rural areas where schools have poor pass rates and students face few employment prospects. Implementing such a model in South Africa would be difficult since there are significant differences between the local situation and the conditions in rural India. This paper explores those differences and examines the potential and challenges of implementing a similar model in South Africa.[*]

[*] Our sincere thanks to Yogesh Kulkarni, Director of the Vigyan Ashram for his helpful comments on this paper.

Introduction to Vigyan Ashram

Vigyan Ashram was founded in 1983 by Dr. Shrinath Kalbag. During two years spent at the University of Illinois, Chicago, where he completed a PhD in Food Technology, Dr Kalbag observed how technology was applied in rural America and this fueled his interest in promoting the use of technology in rural India. In 1982 he sought early retirement from his position as head of the Engineering Sciences Department at the Hindustan Lever Research Center in Mumbai, to pursue his dream of bringing technology to rural India. (Vigyan, 2006a)

The site for the ashram, Pabal in the Pune district, was selected as being typical of rural India. The intention was to ensure that the development did not depend on any particular favourable conditions and so could be applied in other areas. The area is characterized by drought and for seven months of the year water has to be purchased. Being 20km from any major road, the ashram faces the kind of transportation difficulties characteristic of rural life in India.

Vigyan Ashram offers a Basic Diploma in Rural Technology (DRT) over one year. Students live and work at the ashram and learn a range of practical skills covering four areas: agriculture and animal husbandry, home and health, engineering and energy. After completing the diploma, students select a focus for their work and get placed in an informal apprenticeship with a local business. After a year to eighteen months of working, they are assisted in setting up their own businesses. Since it's origin in 1983, the Ashram's graduates have set up over 800 small enterprises including poultry farms, manufacturing, construction, computer services, tailoring and communication kiosks.

Learning is hands-on. For example, students are given chickens which they must raise and sell at the market. In the process they record all costs. When sold, costs are settled and students keep any profit they make. Students provide services for the local community by repairing or making tools and equipment or by performing health tests. Each student plants a tree (which includes bringing fertile soil to the ashram) and takes responsibility for it. Due to the water shortage, it is not uncommon to see students washing next to their trees in order to water the trees.

One of the outcomes of the system has been a high degree of innovation on the part of students. Students have developed a low-cost mini-tractor and low-cost, earthquake-proof construction methods. Many students base their businesses on their own innovations developed during their time at the ashram. One of the most successful of these has been the 'Pabal Dome' which was developed by a staff member, Mr. Vijay Kumar and a student, Mr. Kasim Inamdar. The Pabal Dome is a geodesic dome, supplied in kit form, which provides cheap, durable, easy to construct, flexible housing that is safe in areas that experience earthquakes and cyclones. The ashram also houses an MIT 'FAB LAB' – a complete fabrication system that makes use of high technology to fabricate a wide

range of items. This system is being used to make jewelry, children's toys, torches and battery powered lamps[1].

The ashram has two intakes into the diploma course of about 30 students each year. Initially, the focus was on local students, but they now get students from as far as 4000 km away. Due to the popularity of the program, it has been expanded into schools, by offering an Introduction to Basic Technology (IBT) course. The IBT curriculum is similar to that of the DRT, but is not residential and is run one day per week at regular schools. Students learn the skills as a part of their curriculum and can appear for the exam. The advantage is that, even if the students drop out of school, they have some skills to take into the world of work. Each school buys the required equipment from the ashram and identifies local trainers. This program is currently running in 23 schools.

Instructors for the IBT are generally skilled artisans from local community, but they tend to be less educated and lack the ability to explain concepts and principals behind their skills. To provide uniform quality of instruction, the ashram developed 'reality learning engine' software which allows the compilation of computer based training (CBT) courses in local languages and in keeping with the education philosophy of self-paced learning and self-evaluation. They have developed CBT software that teaches students to build and configure a personal computer.

Prompted by the need to connect instructors at rural schools with experts, the ashram has installed a leased line to Pune and a wireless local loop tower that provides Internet access to a radius of 35km. Kiosks in the local villages dial into the ashram which acts as an internet service provider (ISP). In conjunction with the Indian Institute of Technology (IIT) in Mumbai, local farmers are now offered a service to ask questions about their agricultural problems and get advice. Questions are directed to experts employed by the Department of Agriculture at an agricultural centre. Internet kiosks are set up in existing businesses and the owner acts as operator, interpreter and scribe for the often illiterate farmers.

Key Features of the models

The Vigyan Ashram can be understood in terms of a number of intersecting models – the business model, the educational model, the information model and the technology model. In this paper we consider only the first two of these. The other models will be explored in subsequent papers.

The educational model

The educational model is unique in respect of who is learning; what they learn; how they learn and who facilitates the learning.

The learners in this model are defined as 'school drop-outs'. School drop-out rates in India are very high – 52.79% in grades I to VII and 62.58% in grades I to X for the years

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1 The progress of the FAB LAB projects can be monitored at http://fab.cba.mit.edu/labs/vigyan/blog.

2002 to 2003 (Ministry of Human Resource Development 2005:262). The learning philosophy of the Vigyan Ashram is that anyone can learn and that learning is more easily mastered if it is meaningful to the life of the student. The approach is based on the observation that, despite school drop-out rates being high, most people go on to live productive and useful lives. Admission to the BRT course requires a grade 8 pass, willingness to work by hand, and enthusiasm. Preference is given to students from rural areas.

The curriculum for the Basic Diploma in Rural Technology was developed after a process of consultation with local communities which included observation of their work and working environment and asking about skills they used or could use. Suggestions included services to repair tyres; vaccination facilities; information about water prospecting and how to make and sell potatoe chips (from a potatoe-growing region). This process ensured that the curriculum is relevant.

Students study

- 'Engineering', including construction & fabrication
- 'Energy and Environment', including electrical, solar, biogas, smokeless chulha[2], motor rewinding
- 'Agriculture and Animal Husbandry', including agriculture, nursery techniques, poultry, goat farming
- 'Home and Health', including rural laboratory, food products, and sewing

Students complete a project in each section and have to learn to use a computer to type reports and give presentations.

Students learn 'while doing'. Students learn to repair motors by working in the workshop on repairing motors brought by local people. They learn to analyse soil by analyzing soil samples brought to the ashram by local farmers. There are no classrooms in the Ashram. However, in order to get a recognised qualification, students sit an examination administered by the National Institute of Open Schooling who award the Diploma.

Instructors are expected to be skilled entrepreneurs who are currently practicing their skills in business. Instructors should be "resident in the area, have close rapport with the community … be enterprising … be willing to teach others" (Vigyan, 2006b). This means that they can pass on entrepreneurial skills in the process. There have, however, been some difficulties in sourcing the right instructors as many who have the requisite business and technical skills lack the confidence and language to act in the role of 'teacher'.

The intended outcome of the BRT program is that students become entrepreneurs. Students get exposure to business principles and are taught to keep accounts and to cost services. The approach to learning is characteristic of constructivist approaches to education such as the theories of cognitive apprenticeship, situated cognition and shared cognition (Leonard, 2002). The progression to working in an apprenticeship arrangement

[2] A chulha is a stove used for domestic cooking.

allows the students to develop skills in line with the theory of situated learning (Lave and Wenger, 1991). Situated learning concerns the process by which students begin as 'legitimate peripheral participants' in a community of practice and move towards full participation. In the Vigyan Ashram model, the year of learning in the diploma program allows the students an opportunity to understand their own interests and aptitudes before committing to a particular line of work.

The business model

We focus on some central elements of the business model: multiple income streams and low costs; the fact that it is based on identified needs in the community; that the growth of the Ashram has been organic and that the strategy of "success stories" provides a way to establish the value of the service in the minds of the community.

Vigyan Ashram has several sources of income – student fees, income from services to the community, sale of CBT courses, sale of food products, income from schools that run the IBT course and income from the provision of internet access. Students are paid for services rendered to the community during their training and are expected to meet their living expenses from this income. Services provided are based on clearly identified local needs. Costs are kept low. All equipment used from buildings to furniture to computers is made and maintained by the students. Student living conditions are basic - a dormitory with a bed for each student. Facilities are simple with a focus on what is practical and students take pride in what they have created.

The services offered are based on needs identified by the community and the growth of services and income streams has been organic. Additional services have been added as new needs have been identified and as finance for more complex infrastructure has become available. There is a willingness to experiment and to modify the services offered depending on the response. This responsiveness to local conditions ensures ongoing financial viability.

In introducing services, the approach has been to add services to existing successful businesses rather than to start entirely new enterprises. Internet kiosks were opened in existing businesses where they were able to be sustained while the market was developed. When the internet service for agricultural information was introduced 'success stories' were sought where farmers could quantify the benefit of the information they had received in financial terms. Charges were introduced for the service only once there were sufficient success stories for the farmers to understand the value of the information.

Applying the model in South Africa

The Vigyan ashram offers a model of a low-cost, sustainable, appropriate education that leads to students creating their own employment. It was implemented in a rural area with minimal resources and addresses the educational needs of students who do not succeed in the traditional school system. As such it has immediate appeal for the South African situation. This section seeks to examine some of the unique aspects of the situation in India and compare them with South Africa to understand what barriers there may be in transferring the model.

Comparing India and South Africa

The average population density in India is around 300 people per sq km. The area around Pune, which is in the Mararashtra district, has a population density of 314 people per sq km (Registrar General, India 2001:Ch5:3). By comparison, South Africa has an average population density of 36.6 people per sq km[3]. Rural areas in India are thus more densely populated than they are in South Africa.

Definitions of rural and urban are a matter of debate in South Africa (Statistics South Africa 2003) and changes in the definitions has made it hard to quantify movements between urban and rural areas. One set of definitions suggests that between 1996 and 2001 the proportion of the population living in urban areas increased from 55.1% to 57.5% (Statistics South Africa 2003:11). However, the percentage of the total population of the country living in Gauteng increased from 18.1% in 1996 to 23.7% in 2001. There were substantial decreases in the Eastern Cape, Limpopo and the Northern Cape[4] (Statistics South Africa, 2004:4-5). This suggests that people are moving from the more rural provinces to the more urban Gauteng.

In India, although many villagers aspire to city life, statistics showing population changes by states and union territories do not show the same trends (Registrar General India 2001:Ch3:5). A study of South African households that included both pensioners and children, found them poorer, more likely to be in a rural area and characterized by the absence of the child's father or mother (Duflo 2003). Rural communities in India appear to sustain more 'complete' societies and cities do not appear to hold the same attraction that they appear to in South Africa. These impressions need further research to confirm.

India is 'a land of small farm holders'. The average size of a farm is 1.18 hectares, but a total of about 38% of the land in the country is cultivated. The country produces 200 million tones of food grains and is self-sufficient in food production (Venkataramani 2006). While the statistics are not directly comparable, in South Africa there tends to be fewer, larger farms[5]. Twelve percent of the total land in South Africa is cultivated and only about 2% of the population is economically active in the agriculture, hunting, forestry and fishing sectors (Department of Agriculture 2006). Thus South Africa does not have the same volume of small farmers that India has.

While traveling in Pune, the researchers noticed that the ICT infrastructure in rural areas appears better than that in South Africa. There are Internet kiosks in many villages and access is relatively cheap with rates at internet cafes in Pune, less than R8.00 per hour.

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[3] Population of 44 819 778 divided by an area of 1 223 201 sq km (Department of Agriculture 2006)

4 In the Eastern Cape from 15.5% to 13.5%, in Limpopo from 12.1% to 10.5% and in the Northern Cape from 2.1% to 1.8%.

5 Statistics for 2002 put the number of 'commercial farming units' at 45 818, while statistics for 1991 record about 1.3 million 'small-scale farmers' (Department of Agriculture 2006:6).

Another impression which is difficult to quantify is the different approaches to materialism in the two countries. In India the heroes are Ghandi and (second prime minister) Lal Bahadur Shastri who are revered and praised for humility and living simple lives. In South Africa, particularly among the youth, materialism is valued and sought after. The aspiration of South African citizens from different backgrounds appears to be toward affluence and the owning of things characteristic of Euro-American economies. While India has a rising middle class that shares these values, there appears to be a substantial population that resists the 'Western' values and is apparently characterized more by acceptance that aspiration. The anomaly is characterized by the comment of a headmaster at a farm school in Gauteng who explains that the workshops for technical training stand empty as students choose to do 'academic' subjects and aspire to university education and white-collar jobs. In reality very few of his students get university level passes.

India appears to be a highly deregulated country. By comparison, South Africa appears to be on a trajectory of increasing regulation. Regulations surrounding the formation and running of businesses and increasingly complex and restrictive labour laws make it difficult for small businesses to operate. Education is regulated by the Department of Education and bodies established to monitor quality. Health care is regulated in terms of who may offer what services.

Transferring the models

Education in South Africa takes place within the National Qualifications Framework (NQF) and under the control of the South African Qualifications Framework (SAQA). This means that the program and the institution offering it would have to seek accreditation with the relevant SAQA accredited Education and Training Quality Assurance (ETQA) body. The process of seeking accreditation is complex and lengthy and would add to the cost of setting up such a program. Accreditation as a provider necessitates having a quality management system, policies for managing staff, policies for dealing with students, policies for managing assessment, and defined reporting systems (SAQA, 2001, p21). The Vigyan Ashram has informal systems which would not qualify in terms of the SAQA guidelines.

Depending on the curriculum to be offered, the program is likely to fall under more than one of the ETQA's. The multi-disciplinary nature of the program currently offered by the ashram could be regarded as falling under one or more of ten possible sectors[6]. Currently, regulations stipulate that "a provider should be accredited by a primary focus or single ETQA" and "may have an extension of that accreditation from another ETQA" but SAQA is grappling with how to apply this regulation (Mokhobo-Nomvete 2000:46). It is not clear how the regulation would apply in the case of this kind of integrated course.

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6 The course could conceivably fall under AGRISETA (agriculture), CETA (construction), CHIETA (chemical industries), CTFL (clothing, textiles, footwear and leather), ESETA (energy), ETDP (education, training and development), FOODBEV (food and beverages manufacturing), HWSETA (health and welfare), ISETT (information systems, electronics and telecommunication), or MERSETA (manufacturing, engineering and related).

The curriculum and pedagogies implemented at the Vigyan Ashram are unusual and we are not aware of their use in the South African education system at present. The curriculum is designed from the ground up and this is contrary to current top-down approaches to curriculum development (Department of Education 2002). It is not clear how such a non-traditional program would be viewed. SAQA has stated that in developing qualifications and unit standards, the overriding consideration is that: "Programmes are flexible and designed with national needs as well as the needs of prospective learners and employers in mind; their form and structure encourage access and are responsive to changing environments; learning and assessment methods are appropriate to the aims and purposes of the programme" (SAQA, 2001, p23). Such a program would clearly support these aims.

The learning model at the ashram focuses on self-learning facilitated by 'experts' who can direct students. Despite many recent developments in the South African educational system, there has not been a significant reinterpretation of the role of the teacher. In high schools, teachers still stand in front of the class and 'transfer' knowledge from their heads to the heads of 'learners'. The Revised National Curriculum Statement has high expectations of teachers who are 'qualified, competent, dedicated and caring' and are 'mediators of learning, interpreters and designers of Learning Programmes and materials, leaders, administrators and managers, scholars, researchers and lifelong learners, community members, citizens and pastors, assessors and learning area/phase specialists' (Department of Education 2002:9). Clearly this is at odds with the use of local craftspeople with no educational qualification as facilitators of learning.

The consumer culture prevalent in South Africa raises the question of whether the education provided in a course like the BRT would be valued by the prospective students. If students all want white collar jobs, it may be difficult to persuade them of the value of learning about basic rural technologies.

The goal of this model of education is to create entrepreneurs. Students should be able to begin their own small businesses within a year or two of completing the diploma. Regulatory obstacles to setting up small businesses may make this more difficult than it is in India – both in terms of the running of the business and in terms of the choice of services to offer. For example, medical services could not be offered in South Africa.

The business model relies on having a critical mass of small farms and other businesses in the area. Small farms and other businesses not only provide trainers and apprentice students, but they make use of the services of the ashram and act as bases for new services (such as the internet kiosks). India has a wealth of small farms and other businesses, even in small villages in the rural areas. For example, there are an estimated 10,521,190 small scale industrial undertakings (SSI's)[7] in India (SIDO 2006). In South Africa, it is estimated that 2.3 million people (5.1% of the population) are running small

[7] SSI defined as having fixed assets in plant and machinery worth less than 10 million rupees.

businesses[8] (Lehola, 2002:5). It is not clear whether this will provide the critical mass of businesses that would make the model sustainable.

Conclusion

The Vigyan Ashram offers a model of a self-sustaining student and community driven learning facility. Being self-sufficient, it is cheaper than the traditional model of 'schools' that current education policies pursue. The curriculum of the BRT course was developed 'from the bottom up' and addresses the particular needs of rural communities. The model is suited not only for young people, but can equally be applied to learners of any age, in keeping with the national vision for lifelong learning.

The model focuses on 'failing' students, and offers them a path to a sense of accomplishment, increased self-worth and meaningful work in the community. This is likely to have benefits in terms of reducing problems of disaffected and unemployed youth. The benefits to the students and the community are mutual with greater integration between the two. Students provide services to the communities, while communities pay for the services and enable students to study. This model encourages a sense of connectedness on the part of students and is likely to lead to stronger communities with students more committed to the communities when they enter them as adults.

Implementing such a model in South Africa would involve understanding and overcoming significant differences including the higher degree of regulation in the country; difficulties in introducing unusual approaches to education; less populated rural areas with demographic anomalies; fewer small farms and businesses in the rural areas; and a consumer culture and tendency to see cities as the source of wealth and opportunity.

We believe that the Vigyan Ashram model could be the basis of a self-sustaining local model of education that would introduce relevant technologies into rural areas, turn school 'failures' into productive and involved members of the community, provide needed services to rural communities and, in the long run, make it more attractive to remain in rural communities.

References

Department of Agriculture (2006). Abstract of Agricultural Statistics. Pretoria, Agricultural Information Services, Department of Agriculture: 107.

Department of Education (2002). Revised National Curriculum Statement Grades R-9 (Schools). Education. Pretoria, Department of Education: 29.

Duflo, E. (2003). "Grandmothers and Granddaughters: Old-age pensions and Intrahousehold Allocation in South Africa." The World Bank Economic Review. 17(1): 1-25.

Fab Lab http://fab.cba.mit.edu/

Kulkarni, Y. (2005). Conversation at Vigyan Ashram. Pabal, Pune

[8] That is, businesses not registered for VAT.

Lave, J. and E. Wenger (1991). Situated learning: legitimate peripheral participation. Cambridge, Cambridge University Press.
Lehohla, P. (2002). The contribution of small and micro enterprises to the economy of the country: A survey of non-VAT-registered businesses in South Africa. Pretoria, Statistics South Africa.
Leonard, D. C. (2002). Learning theories, A to Z. Westport, Greenwood Press.
Mokhobo-Nomvete, S. (2000). "The principle of provider accreditation through one ETQA and ways of ensuring quality provisioning across sectors." South African Qualifications Authority Bulletin 4(2): 45-48.
Ministry of Human Resource Development (2005). Annual Report 2004 - 2005. New Delhi, Ministry of Human Resource Development, India: 314.
Registrar General, India. (2001). Provisional population totals, census of India, 2001. New Delhi, India, Office of the Registrar General, India. 2006.
SAQA (2001). Criteria and guidelines for providers. Pretoria, South African Qualifications Authority: 33.
SIDO (2006) Small Industries Development Organisation http://www.smallindustryindia.com/sido/sido.htm Accessed 16 May 2006.
Statistics South Africa (2001). Census 2001 at a glance. Pretoria, Statistics South Africa. 2006.
Statistics South Africa (2003). Investigation into appropriate definitions of urban and rural areas for South Africa. Census 2001. Pretoria, Statistics South Africa: 195.
Statistics South Africa (2004). Census 2001: Primary tables South Africa - census '96 and 2001 compared. Pretoria, Statistics South Africa: 103.
Venkataramani, G. (2006). Country profile: India. New Agriculturist online.
Vigyan (2006a). Dr.Kalbag: A Karmayogi, Founder Director of Vigyan Ashram. Pabal, Vigyan Ashram. 2006.
Vigyan (2006b). Introduction to Basic Technology Program for Schools, Vigyan Ashram. 2006.

Developmental Informatics Workshop

Monash South Africa will be hosting a workshop on Developmental Informatics on the 5 July 2006 at the campus in Roodepoort.

At present, the following organisations have confirmed their participation:

- Monash South Africa
- Monash Australia
- Monash Malaysia
- IITB, Mumbai, India
- SA Government Communication and Information Systems (GCIS)
- Shuttleworth Foundation
- Wits University
- SAP
- SystemicLogic

If you are interested in attending, please contact Jacques Steyn at Monash South Africa.