

EVALUATION OF ENVIRONMENTAL EDUCATION CENTRES - A RESEARCH DESIGN FOR THE CASE STUDY METHOD

Salomé Schulze

ABSTRACT

A research design for evaluation of environmental education centres by means of the case study method is explained. This method may be divided into four stages: selecting a case, gathering data (by studying documents and archival records, conducting interviews, direct observation and by means of questionnaires), analysing the data and writing the report. Validity, reliability and some ethical principles when writing the report are also mentioned.

INTRODUCTION

Much has been written about the evaluation of environmental education programmes in South Africa (Irwin & van Rensburg 1991; The Urban Foundation 1991; McNaught, Taylor & O'Donoghue 1990; O'Donoghue & Taylor 1989; Wright 1988; Odendal 1986). When studying these papers two points become apparent:

- * Predominantly qualitative research designs seem to be preferable to predominantly quantitative research designs;
- * evaluation should be an integral part of all programmes at all centres, therefore action research by the field officers themselves (instead of by outside experts) is promoted.

Although the author cannot but agree with these two points, those in the field at environmental education centres may sometimes feel the need to have their programmes evaluated by the "objective" outsider for the following reasons:

- * A recent tour to nine environmental education centres in South Africa revealed that some field officers experience uncertainty. This may stem from not having been trained in either environmental education or in research methodology. Because of this, some officers expressed the wish to watch officers at other centres in action. Unfortunately lack of time and opportunity sometimes prevented this. It was also often stated that although discussion with and observation of colleagues did take place, it was mainly with those of the same centre, leading to similar approaches being used at one centre which differed from those at another centre.
- * Staff at environmental education centres may also want to have their programmes evaluated by an outsider if this could strengthen their cause. For example, those in the formal education sector who are concerned about environmental education are eager to promote close cooperation between their system and environmental education centres. This cooperation is sadly lacking in some instances in spite of a recommendation in the *White Paper*

on *Environmental Education* (Department of Environment Affairs 1989:7) which advises close collaboration between the formal education system and environmental education centres. Would it be reasonable to accept that recommendations for such cooperation could be strengthened by support from those in the formal sector who are knowledgeable but not directly involved in environmental education centres? This could be particularly important if environmental education is infused into existing school curricula. This could easily lead to a situation where visits to environmental education centres are regarded as superfluous. Recommendations for the visiting of centres from those who cannot benefit directly from such visits would surely aid the cause of those in the field. These recommendations would have to relate to the work being done in the centres. Thus evaluation inevitably comes to the fore.

Evaluation may be defined as "... judging the worth or value of an educational programme" (Bennett 1988/89:14). How can the value of environmental education programmes be evaluated effectively? The remainder of the article will be devoted to answering this question.

METHODOLOGY

The advantages of predominantly qualitative research measures in comparison with predominantly quantitative measures for the evaluation of environmental education programmes, have been stressed by some authors (Irwin & Van Rensburg 1991:4; Odendal 1986:14; Staley in Chenery & Hammerman 1984/5:36).

This accords with an increasing number of researchers who are turning away from traditional positivistic approaches towards the use of more naturalistic approaches. This trend, beginning in the 1970's, has led to the statement by Campbell that if qualitative and quantitative results contradict each other "... the quantitative results should be regarded as suspect until the reasons for the discrepancy are well understood" (Fetterman 1988:5).

In this regard, quality is the essential character or nature of something, whereas quantity is the amount. Therefore, quality is the what and quantity is the how much. At root, qualitative research wants to describe what is occurring in a given place and at a given time (Van Maanen *et al.* 1982:16).

The strength of the case study method is that, although mainly qualitative in nature, it may make use of quantitative information when necessary. For example, calculating staff turnover or how many groups return to the same environmental education centre each year could be significant. Apart from this, the case study method predominantly makes use of qualitative techniques because it is by definition a naturalistic approach. With this approach events are thus studied "... within their real-life contexts" (Yin 1984:67). In this regard the case study may be seen as a return to natural observation as a reaction against the positivist epistemology implied in the psychostatistical paradigm (Stenhouse 1988:49). Thomas (1989/90:4) also states that the strengths of the case-study approach are the representation of diverse viewpoints and interests and the rich information thus obtained.

With regard to examining environmental education programmes Taylor and Wynn (1984) explain why case studies are so valuable:

- * They help to indicate where improvements may occur;
- * they highlight the roles of individuals;
- * they are flexible and can involve a variety of people;
- * they establish a simple technique for individuals or organisations to monitor progress and assess their own performance. With regard to the latter, Yin (1984:55-56) stresses that it is a misconception that doing a case study is an easy method which can be mastered without much difficulty. He states (p.56):

In actuality, the demands of a case study on a person's intellect, ego, and emotions are far greater than those of any other research strategy. This is because the data collection process is not routinised ... Rather, a well-trained and experienced investigator is needed to conduct a high-quality case study because of the continuous interaction between the theoretical issues being studied and the data being collected.

Yin (1984) regards having the following skills as necessary for conducting a case study effectively: A person should be able to ask good questions, be a good listener, be adaptive and flexible, have a firm grasp of the issues being studied and be unbiased by preconceived notions.

Before the case study method may be used to conduct an evaluation, a pilot case study should be undertaken to refine data collection plans with respect to both the content of the data and the procedures to be followed (Yin 1984:74). It should be stressed that in this regard the pilot case

study differs from that of the pilot study in quantitative research. In the latter case the pilot study is a "dress rehearsal" to pre-test the collection plan as faithfully as possible. However, with regard to the pilot case study, the aim is to help the researcher design the actual case study protocol.

The author therefore conducted a pilot case study with the aim of designing the research plan for the actual study which may be used for the evaluation.

The centre where the pilot case study was conducted was chosen on the grounds of access because of prior personal contact with one of the field officers at the centre. Also the specific centre seemed to be rather prominent in the field of environmental education in South Africa and therefore the expectation existed that it would offer all the elements of ideal educational programs. Apart from this it was geographically within easy driving distance.

The pilot case study was conducted over a period of three days during which a group of standard five children visited the centre. The author was accompanied on this visit by a co-researcher also interested in the field of environmental education.

Fieldwork was conducted for the pilot case study by using the following qualitative techniques: unstructured interviews, on-site observation and the study of documents such as worksheets. In the field, extensive field notes were taken. This occurred unobtrusively as the children also took notes whenever they wished. Notes were also made directly after interviews. From these field notes a research design for the evaluation of environmental education centres by means of the

case study method was developed as follows.

THE STUDY'S QUESTIONS

The main question to be asked is: "How are things going at centre A (and/or B and/or C)?" In order to answer this general question certain specific questions have to be answered. In keeping in mind the Tbilisi guidelines for achieving environmental education goals, these questions may be the following (Opie 1990):

- * Were all aspects of the environment considered ... natural, built, ecological, political, economic, technological, social, legislative, cultural and aesthetic?
- * Was there continuity from pre-school to adult education?
- * Was the approach inter-disciplinary, emphasising knowledge, skills and values from a holistic and balanced perspective?
- * Was there active participation on the part of the children in environmental problem-solving?
- * Was the focus relevant to current and potential environmental issues; locally, regionally, nationally and internationally?
- * Were the different cognitive, affective and psychomotor goals suitable for each age group?
- * Did the officer have a proper starting activity to set the scene for what was to come?
- * Was the focus on do-it-yourself instead of "show and tell", speaking as little as possible?
- * Did the officer make use of unexpected opportunities which arose during the field trip?
- * How did the field officer handle the group e.g. was he always warm and friendly, using names, making eye-contact, remaining in control?
- * Did he choose his activities carefully and vary

them continuously to prevent boredom?

- * Did he have a proper closing activity to draw all the threads together?
- * Were there any unanticipated outcomes?

The actual case study falls into four phases: selecting cases and negotiating access, fieldwork, analysing the data and the writing of the report. Each of these will now be discussed.

SELECTING CASES: SINGLE OR MULTIPLE CASE STUDIES

If the objective of the evaluation is to ascertain "how things are going" at different centres, a multiple case design is appropriate. In this instance it may be advisable for a team of researchers to conduct the case studies. Each centre would then be regarded as a single case study. From the results of the multiple case studies an overview may eventually be written in which conclusions and recommendations may be made.

In choosing the different cases Yin (1984:48) states that every case should serve a specific purpose in the overall scope of enquiry. Multiple cases should be considered as one would consider multiple experiments - a "replication" logic should be followed. This is far different from a mistaken analogy in the past, which incorrectly considered multiple cases to follow a "sampling" logic. In agreement with Yin, Stenhouse (1988:50) states that random sampling is only applicable where case studies conducted within a sample run alongside quantitative methods

MAKING FORMAL CONTACT

Once sites have been selected, formal contact should be made. The purpose of the research should be explained truthfully and permission to conduct an evaluation asked. The researcher should be prepared to explain how the data will be used, why that particular centre was chosen and how those involved would be protected. Thereafter fieldwork may start.

FIELDWORK

Fieldwork is that process of evoking, gathering, and organising information which takes place on, or in close proximity to, the site of the events or phenomena being studied (Stenhouse 1988:50).

The following sources of evidence for answering the specific questions asked in each case are described by Yin (1984).

Documentation

The following documents at environmental education centres may be studied: letters, files, agendas and minutes of meetings, administrative documents - progress reports and proposals, other evaluations of the same centre and newsclippings appearing in the mass media. If there is a library or bookstore at the centre it may also prove a valuable source of information.

Archival Records

The following may also be relevant: service records showing the number of clients served over a given period, organizational records, maps and charts of the geographical characteristics of a place,

survey data, personal records such as diaries and telephone listings.

Interviews

The interview is one of the most important sources of evidence and will typically dominate observation because of time constraints. An interview is a conversation with a purpose (Murphy 1980:75). However, when conducting evaluation these interviews will be in-depth interviews. These are repeated face-to-face encounters between the researcher and informants directed toward understanding informants' perspectives on their experiences as expressed in their own words.

The nature of these interviews will be informal, as close to observation as possible, non-judgemental and open-ended. The interviews will be many and short and conducted in informal settings - walking along a path or having lunch in the veld. Rapport should be established and non-directive questions asked early in the research to learn what is important to informants. Only then should the evaluation become more focused by means of the questions identified earlier and written down in an interview guide.

Another key to successful interviewing is knowing how and when to probe. The researcher will probe for details of experiences and meanings attributed to them. Key informants (individuals who are very familiar with the centre's programmes and its environment) can be a tremendous source of information and make evaluation much easier.

A tape recorder may be used and is more reliable than recalling a conversation from memory. The

tape recorder should be small and placed out of sight. However it should be kept in mind that note-taking comes across as less serious and formal than tape recording (Murphy 1980:86). Many people clam up when a recorder is used. Apart from that it should be remembered that estimates have revealed that one hour of recording takes a typist about nine hours to transcribe! (Murphy 1980:87). If, however the recorder is used, Stenhouse (1988:51) recommends the following procedure when tapes are transcribed: the recording may be played through and notes be made on pages divided into three columns: one contains the tape recorder counter number, the second contains a running index of content, and the third contains verbatim quotations.

For those researchers who experience the use of a tape recorder as intrusive it is best to record conversations at the earliest possible chance - preferably while still on site.

Who should be interviewed? According to Taylor & Bogdan (1984:83) neither the number nor the type of interviewees should be specified beforehand. The strategy of theoretical sampling may be used for selecting people to be interviewed. This means that the numbers of those interviewed are not important. What is important is the potential of each interviewee to aid the researcher in his evaluation. Therefore the researcher would consciously vary the type of people interviewed until all the perspectives held by different people on the issue at stake are revealed. The following people may be important: all the staff at the centre - not only the field officers but also the "woman in the kitchen", the teachers, parents or lecturers accompanying the groups and some of the children

or students themselves. Interviewing is also useful with very young children or with those who cannot read English or Afrikaans well. Group interviews with children as the chance arises, also have great potential for evaluation.

Questions such as the following may be used as starters to interview the accompanying teachers:

- * Why did you choose to visit this specific centre?
- * Do you feel the objectives of your visit are being met?
- * What do you think of each of the activities?
- * Are you happy with the accommodation and food?
- * Do you think you may visit this centre in future - why/why not?
- * Are there any outcomes of which you are aware that were unanticipated?

If the occasion arises (and this should be possible over a period of time) small groups of children may be interviewed asking questions such as the following:

- * Are you enjoying the trip - why/why not?
- * What have you learned?
- * How have your feelings been strengthened or changed?

The following would probably be an important line of questioning for the field officer:

- * Why did you choose to become a officer at this centre?
- * Do you enjoy your work - why/why not?
- * What are your main obstacles in your work?
- * In which area, if any, do you feel a lack of knowledge or skills?
- * What are your objectives?
- * Which activities did you choose and why?

- * How do you cater for different age groups?
- * How do you evaluate what you do?

On-site observation

By being present throughout the trip the researcher may also make direct observation to gather evidence to answer the specific questions concerned. "By observing is meant perceiving appearances, events, or behaviour (including speech)" (Stenhouse 1988:51). Apart from focused observation, unplanned, unexpected data may be collected during observation. Therefore observation and interviewing should be conducted simultaneously. Observations may lead to specific questions asked during interviews, whereas given answers may lead to focused observations being made.

What else should be observed? Murphy (1980:114-118) names the following:

- * Individual characteristics that may be significant when doing the evaluation are the sex, race, dress and appearance of the interviewee.
- * Interactions may be clues to power relationships, decision-making processes, current issues, pressing crises, management styles, important actors, standard procedures, attitudes towards clients, levels of enthusiasm and general climate.
- * Nonverbal behaviour may include signs of boredom, disinterest, irritability or nervousness.
- * Physical surroundings refers to the setting of the programme. The quarters where the staff are housed, chipping paint and the like may be important clues to follow up. Physical artifacts may also include: worksheets (do they make provision for

different age groups and objectives?); water test kits; maps; exhibits; compasses; canoes; equipment for adventure activities such as abseiling; bulletin board displays; posters.

It is important that the researcher takes notes in his field notebook throughout the field trip and writes down quotes. With regard to the latter, it is important that there be clear indications to distinguish paraphrase from quotation when overhearing conversation. As the children normally also take notes during such a trip, taking field notes may be done quite unobtrusively.

At first, everything should be observed. The main questions mentioned earlier may later be used as guidelines for note-taking. Therefore self-activity by the children in each of the activities, the overall handling of the group by the field officer, the way in which a variety of approaches are used and making use of unexpected opportunities, are only some examples of observation that should be noted.

To increase the reliability of the observations research may be conducted in pairs to allow for multiple observers.

Questionnaires

Although Yin (1984) does not include the use of questionnaires in doing case study work, other authors do (Stenhouse 1988:49). This technique may be important when the research must be concluded because of time constraints and there are still some unanswered questions. It may also be useful if the researcher wants to have information on what happened some time after the trip when the children are back home. Questionnaires may then

be sent to schools for completion by the teachers as well as the children. These questions may be of the open-ended kind.

The following may be asked of the teacher:

- * Reflecting on your trip to centre A, what do you consider to be the most successful part of the trip and why?
- * What do you consider to be the least successful part of the trip and why?
- * Do you notice any change in the attitudes and/or behaviour of the children with regard to the environment? If so, please give examples.
- * Do you plan to visit centre A again? Please justify your answer.

The questionnaire for the children may contain similar questions.

ANALYSING THE DATA

The researcher should try to suspend his evaluation until all fieldwork has been completed (Ruddick 1985:102 & 104). The fieldwork is finished when saturation level is reached and conclusions may be drawn. More probably time constraints will bring the research to an end. In evaluating environmental education centres, spending two to four weeks at a centre should be adequate for an evaluation. Evaluation involves drawing inferences from what could be anything from 200 to 1 000 pages of "case data". Before beginning to analyse the case data, however, all the data should be duplicated for purposes of reliability checks. The reason for this is that if the analysis is to be done manually, the data will be cut up after it has been divided into different categories.

These categories are formed according to the questions selected after the pilot case study and used to organise the data. This means that major coding categories are developed which correspond to the questions of the study. A number or a letter is assigned to each coding category. For example, "3" might be self-activity by the children. In the subcategories, "3a" might be art and "3b" language skills such as writing poetry and so forth.

The field notes, transcripts, documents and all other material should be coded. Both positive and negative incidents related to each category should be coded (Taylor & Bogdan 1984:137). The coding scheme may be redefined as the researcher continues with the analyses so that the codes fit the data (and not the other way around!). Thereafter all the data is cut up and placed in a separate file or holder according to each category or sub-category. All the remaining data should either fit in existing categories or new categories may be formed. However, not all the data may be relevant and used. All the data that is used is thus lightly edited, ordered and indexed to form a "case record" (Rudduck 1985:102).

Eventually the researcher may use the case record to come to conclusions and produce the "case study". For multiple case studies, the evaluation is described separately for each of the sites visited. Thereafter an overview, which seeks generalisations across case records, may be written.

Using a microcomputer to analyse the data

Analysing the data from fieldwork may be a "paper-pushing enterprise of monstrous proportions" (Pfaffenberger 1988:12). Therefore

there is always a danger that the bulk of the information gathered may eventually be ignored. Using a microcomputer may help to overcome this problem. Pfaffenberger (1988:21-22) names important advantages of the use of microcomputers when analysing qualitative data:

- * Small, portable, battery-powered microcomputers can be taken directly to the field. Cryptic field notes may then be retyped into the computer directly afterwards - e.g. each evening.
- * There is also a wide variety of useful software available for use in qualitative analyses, such as word processing and other programmes.

WRITING THE REPORT

Murphy (1980:145) recommends spending a day or two reviewing all the notes before starting to write. When writing the report the headings should correspond with the categories and subcategories which were identified according to the questions asked. It should also be decided who the audience is and the style and content adjusted accordingly. The descriptive evaluation should be rich in quotations and should provide evidence in the form of many clear examples.

The reader has to know the following:

- * the purpose of the study;
- * methodology - observation, interviewing, documents, etc.;
- * time and length of study;
- * nature and number of settings and informants;
- * the researcher's relationship with the informants;
- * validity and reliability.

VALIDITY AND RELIABILITY

When conducting an evaluation such as this, Murphy (1980:66) distinguishes two possible sources of bias and error:

- * Hawthorne or halo effect - that is, people reacting to the presence of the researcher;
- * Omission - only a number of sites can normally be visited and at these only a number of events observed, people interviewed and documents analyzed.

To be able to make valid conclusions, certain precautions should therefore be taken. First of all an evaluative frame of mind is a prerequisite:

... you must be willing to suspend judgement, to hold in check your opinions, values, attitudes, and conclusions in an effort to impartially collect and analyse programme data (Murphy 1980:68).

Another set of safeguards involves using multiple methods and multiple sources of obtaining data. The combination of these methods and data offers a strategy to "triangulate" data. Murphy (1980:71) also recommends making use of "the fresh eye of a neutral colleague, not caught up in the evaluation". Eventually each case record may also be sent to the field officers for their perusal and with the idea of bringing about changes if necessary. "The evaluation may thus be less "done to" and more "done with" field staff (O'Donoghue & Taylor 1989:9).

With regard to reliability, the field notes taken by the researcher, recorded interviews, transcribed interviews, the documents and notes from documents serve as primary data with may be

reviewed as "evidence" of the reliability of the study.

ETHICS

When writing a report the following ethical principles should be kept in mind:

- * No data should be used in such a way as to threaten disadvantage to the persons portrayed (Stenhouse 1988:53).
- * The evaluation should not be done covertly - motives and intentions should be clearly stated from the start.
- * Anonymity of those involved should be assured - especially if the results of the evaluation are to be published.
- * Those involved in the evaluation should have a final say in what is being made public knowledge.

CONCLUSION

The main advantages of the case study method for evaluation of environmental education centres, are its holistic and flexible nature as described. This approach should facilitate understanding of the interaction between people, activities and the outdoors at any particular centre.

REFERENCES

- BENNET, D.B. 1988/89. Four steps to evaluating environmental education learning experiences. *Journal of Environmental Education*, 20(2), 14-21.
- CHENERY, M.F. & HAMMERMAN, W. 1984/85. Current practice in the evaluation of outdoor education programs: report of a national survey., *Journal of Environmental Education*, 16, 35-42.

DEPARTMENT OF ENVIRONMENT AFFAIRS. 1989. *White Paper on Environmental Education*. State Press, Pretoria.

FETTERMAN, D.M. (Eds). 1988. *Qualitative Approaches to Evaluation in Education. The Silent Scientific Revolution*. Praeger, New York.

IRWIN, P.R. & JANSE VAN RENSBURG, E. 1991. *Evaluation in Environmental Education*. EEASA Monograph No. 1, Rhodes University, Grahamstown.

MCNAUGHT, C., TAYLOR, J. & O'DONOGHUE, R. 1990. Participatory evaluation: The case of the Natal Primary Science Project of the Urban Foundation. *Southern African Journal of Environmental Education*, 11, 8-12.

MURPHY, J.T. 1980. *Getting the Facts. A Fieldwork Guide for Evaluators and Policy Analysts*. Goodyear, Santa Monica.

ODENDAL, A. 1986. Goal management as an attempt to evaluate nature conservation campaigns. *Southern African Journal of Environmental Education*, 3, 14-17.

O'DONOGHUE, R. & TAYLOR, J. (Eds) 1989. *A Handbook of Evaluation Techniques for Environmental Interpretation*. Umgeni Valley, Howick.

OPIE, F.W.J. 1990. *The Outdoor Classroom*. Department of Environment Affairs, Pretoria.

PFAFFENBERGER, B. 1988. *Microcomputer Applications in Qualitative Research*. Sage, Newbury Park.

RUDDUCK, J. 1985. A case for case records? A discussion of some aspects of Lawrence Stenhouse's work in case study methodology. In BURGESS, R.G. (Ed.). *Strategies of Educational Research: Qualitative Methods*. The Falmer Press, London.

STENHOUSE, I. 1988. Case study methods. In KEEVES, J.P. (Ed.). 1988. *Educational Research, Methodology, and Measurement: An International Handbook*. Pergamon Press, Oxford.

TAYLOR, S.J. & BOGDAN, R. 1984 *Introduction to Qualitative Research Methods. The Search for Meanings*. John Wiley, New York.

TAYLOR, J.L. & WYNN, M.G. 1984. Enhancing environmental education and training through case study experimentation. *The Environmentalist*, 4(3), 235-42.

THE URBAN FOUNDATION. 1991. *Critical Reflections on Teachers in Action*. The Urban Foundation, Durban.

THOMAS, I.G. 1989/90. Evaluating environmental education programs using case studies. *Journal of Environmental Education*, 12(2), 3-8.

VAN MAANEN, J. DABBS, J.M. & FAULKNER, R.R. 1982. *Varieties of Qualitative Research*. Sage, Beverley Hills.

WRIGHT, T. 1988. Pep-up: A review of the Umgeni Valley project evaluation process. *Southern African Journal of Environmental Education*, 7, 15-18.

YIN, R.K. 1984. *Case Study Research. Design and Methods*. Sage, Beverley Hills.