

The Use of Different Research Methods to Better Understand the Responses of Teachers to Aboriginal Education Reform in Taiwan

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Abstract: The present education policy aims to develop a society with multicultural values in Taiwan. In order to adjust teaching methods for students of mixed ethnic background there is a need to promote greater awareness of cultural differences. This paper has two aims. The first aim is to describe in a practical manner how using mixed research methods can better respond to the research questions. Empirical data from author's doctoral research in 2005 illustrate how the use of different research methodologies can provide a holistic view of teachers' perceptions. The second aim is more ambitious: to argue that a combination of qualitative and quantitative data analysis that maintain methodologically advantageous and can increase the validity claims of the research outcomes.

The main research question asks whether the new Aboriginal Education policy in Taiwan creates reform or resistance at the local school level and how these different responses are reflected in the teachers' classroom teaching. The study of teachers' perceptions and change of classroom practice is a complex task. The mixed methods approach is proposed to add the fabric required, illustrating the depth and flexibility needed to explore the educational issues (Merriam, 1998). Mixed methods are a combination of qualitative and quantitative approaches that maintain methodological rigor as well as measures for reliability and validity (Creswell & Miller, 2000; Denzin & Lincoln, 2003a).

Survey questionnaires were conducted in 55 primary schools and the survey return rate of 89% (n=607) is considered to be a very useful rate of response. Factor analysis resolved seven factors which yielded high internal consistency and content validity. The researcher completed semi-structured interviews (n=48) that examined the personal views of teachers. Three themes were uncovered from the interview data: policy; pedagogy and curriculum; and school and family. The findings from the parallel mixed method analysis will be discussed in this paper.

Keywords: mixed methodology, Aboriginal education, policy and practice.

Introduction

The present education policy aims to develop a society with multicultural values in Taiwan. In order to adjust teaching methods for students of mixed ethnic background there is a need to promote greater awareness of cultural differences. Empirical data from author's doctoral research in 2005 illustrate how the use of different research methodologies can provide a holistic view of teachers' perceptions. The purpose of the case study used by the author was to try to understand what goes on in the school context from the teacher's perspective as a way of contributing to the development of inclusive Aboriginal education.

This paper has two aims. The first aim is to describe in a practical manner how using mixed research methods can better respond to the research questions. The second aim is more ambitious: to argue that a combination of qualitative and quantitative data analysis that maintain methodologically advantageous and can increase the validity claims of the research outcomes. Thus, this paper is organized as follows. The second section presents the methodology and research design. This includes the rationale for using the case study, sampling for both the survey and the interviews, and data analytical strategies. The third

section explores directions for data analysis. This is a discussion that attempts to assess the benefits of different methods for data collection and analysis strategies that might be undertaken so as to most usefully increase our knowledge in this area. It is important to note that the findings of this case study are not going to easily generalize outside the case. However, the research attempts to link teachers' perceptions with these changes of practice in Taiwan by providing empirical evidence. The concluding section concludes with examining whether the research aims have been met, and summaries key findings from this case study.

Equal opportunity and Aboriginal education

Primary and secondary education in industrialised countries have undergone profound changes during the past decade. On the one hand, education reform has reflected the specific influences of the country's ideological, economic and political contexts (Bracey, 2002; Trupp, 2002). On the other hand, the literature provides evidence that there are international influences that led to common trends across countries (Carnoy & Rhoten, 2002; Hopkins & Levin, 2000; J. Lee, 2001; Tonso, 2003). Therefore, examination of the education initiatives in Taiwan demands an understanding of the influences that led to the pressure for education reform in the global context.

In discussing Aboriginal education, one of the central issues may be the degree of opportunity: to what extent is opportunity equal across different ethnic groups? Previous research addresses the lack of relevance which formal schooling has for Aboriginal societies, i.e., such educational provision has not been beneficial for Aboriginal people (Levin & Alcorn, 1999; McGovern, 2000; Mickelson, 2003; G. Partington, 1998). Recent studies identify the major factors that have affected the academic achievement of minority students. These factors include school principals' commitments to change, cultural conflict, the poor education of parents and grandparents, teacher attitudes to students' academic performance and the irrelevance and inappropriateness of the State education system (Beresford & Partington, 2003; Brennan, 2001; Cummins, 2001; Mickelson, 2003).

Barriers to equal education for Aboriginal populations detailed in the literature are shared by Aboriginal people in Taiwan. The statistical data of Taiwan, from the *2000 Population and Housing Census (2003)*, show that the higher education participation rate for Aboriginal people is 8.2 %, which is much lower than those of the non-Aboriginal population at 24.4% (Directorate General of Budget Accounting and Statistics Executive Yuan. ROC, 2003). There are further problems in Aboriginal education in Taiwan according to the findings of a recent survey. These include the school curriculum, student's learning outcomes, dropout, family circumstances and poverty (Kao, 2000). However, existing research on Aboriginal education has been mostly conducted in Western countries using Western theoretical frameworks for addressing Aboriginal issues. In Taiwan, a considerable body of research has evaluated the outcome of education reform in the 1990s, but little empirical evidence of Aboriginal education initiative has been produced until now. Thus, it is important to locate the Aboriginal education issues within Taiwan's context.

Definition of key terms

This section provides definition the major key terms in this research. These terms are, 'mixed methodology' and 'Aboriginal education'. The term 'mixed methodology' is gaining currency among social science research in the 1990s (Denzin, 1984; Johnson & Onwuegbuzie, 2004; Onwuegbuzie & Leech, 2004; Tashakkori & Teddlie, 2003). Denzin identifies four types of triangulation: *Data source triangulation*, when the researcher looks for the data to remain the same in different contexts; *Investigator triangulation*, when several investigators

examine the same phenomenon; *Theory triangulation*, when investigators with different view points interpret the same results; and *Methodological triangulation*, when one approach is followed by another, to increase confidence in the interpretation. For the purpose of this case study, the researcher adopted the data sources triangulation and methodological triangulations described by Dezin (1984). The utilisations of such triangulations assisted in the understanding of teachers' perceptions of Aboriginal education policy. In the meantime, the terms 'data source triangulation' and 'methodological triangulation' identified by Denzin (1984) were modified to suit the contemporary research literature. Thus, the terms 'mixed methodology' and 'mixed methods' were employed in this research.

The term 'Aboriginal education' is difficult to comprehend for many educators and researchers. Several researchers assert that part of the problem involves an existing conflict between assimilation and minority culture maintenance (Antone, 2003; Beresford & Partington, 2003; Cardinal, 1999; Doige, 2003; Ovington, 1994; Tompkins, 2002). For example, a report on the status of Aboriginal education provides the following descriptive definition: 'indigenous peoples learning in an indigenous curriculum; indigenous peoples learning in the government curriculum; and non-indigenous learners learning about indigenous peoples or in an indigenous curriculum' (Education International, 1998). In this researcher's view, this descriptive definition successfully illuminates the scope of Aboriginal education. The term 'Aboriginal education' in Taiwan is also closer to this view which refers to 'the general education patterned after Aborigine requirements provided to the Aboriginal people' (Council of Indigenous People ROC, 1998). The term 'Aboriginal school' refers to the schools constructed particularly for Aboriginal students. The difference between 'Aboriginal school' and 'Aboriginal district school' is that in the latter, up to one-third of the enrolled total student population are Aboriginal students. Hence, the 'Aboriginal school' has predominately Aboriginal students enrolled. These definitions are embedded in the Taiwanese context of this research. Unless otherwise and explicitly related, all references and legislations refer to Taiwanese legislature and Act.

Research questions

Punch (2004) argues that the research questions come first, and methods come later. Despite differences in primary education systems, the need to improve educational quality for Aboriginal populations is an international phenomenon as has been demonstrated in the Literature Review. Thus, the research questions of this study are:

RQ1: What are the views of classroom teachers of the policy reform in Aboriginal education?

RQ2: What are the factors which affect individual teachers' responses to change?

RQ3: How are teachers' perceptions expressed in their practice (reform or resistance)?

The first research hypothesis was that the teachers in the largest tribal area have different perceptions of the policy in comparison with teachers who taught in the smallest tribal communities. The second research hypothesis was that the demographic characteristics and educational experiences of the teachers will affect their responses to change. The third research hypothesis was that teachers' beliefs will lead them to change to improve classroom practice. The more positive perception teachers have, the more likely they will translate the education policy for Aboriginal children into classroom teaching.

Describing the Research Design

The example the author will describe comes from author's doctoral research at University

of Notre Dame Australia. The research project on which this paper is based comes from the author's research in Taiwan. Taiwan has its own Aboriginal inhabitants of the island of Taiwan. These peoples are distinctly different to the latter arriving Han people from mainland China. The Aboriginal population counted for a total of 397,535 persons or 1.7% of the total population in the Taiwan-Fukien Area according to the 2000 Population and House Census (Directorate-General of Budget Accounting and Statistics, R.O.C. 2003). There are twelve different tribal groups each occupying a particular area. The tribal groups are of unequal size. Sadly, these Aboriginal peoples suffer many of the same social, educational, health and employment disadvantages recorded for other Aboriginal people in Australia (Beresford & Partington, 2003; Gray & Hunter, 2000; Gray & Partington, 2003), Canada and United States (Minore & Boone, 2002).

During the 1990s political reform became more liberal in Taiwan, so the need to change educational provisions for the ethnic Aboriginal population increased. Several initiatives were critically reviewed and plans for reform were proposed in the 1990s. Accordingly, Taiwan's government passed the Aborigine Education Act (AEA) and related legislation in 1998. The 1998 Aborigine Education Act and related legislation were designed to meet more adequately Aboriginal students' needs from kindergarten to higher education. For the purpose of this case study, the AEA mentioned here is specifically related to primary education. The pertinent Articles in the AEA are II, III, IV, and V, which address school education, curriculum, faculty, and social education respectively.

It is argued that in case study research a sound understanding of the nature of the problem is required before the proper method(s) for its research can be determined (Atkinson & Hammersley, 1994; Bassey, 1999; Neuman, 2000; Punch, 2004). In order to enhance the background knowledge, an examination of relevant policies and strategies of Aboriginal education reform in Taiwan during the 1990s was conducted. The researcher critically reviewed the 1998 Aborigine Education Act (AEA) prior to conducting the pilot study and formal research. In the pre-empirical stage of research, the researcher investigated 'What does the Taiwanese government say should be done in relation to Aboriginal education?' The researcher examined the intended program, its policies and curriculum guides. The empirical stage of research is described in the following paragraphs.

This research investigates the results of legislative efforts to improve education for Aboriginal Taiwanese people. A two case study design was chosen. The purposive sample aims to investigate the significant differences in attitudes to current reforms between teachers in a small Aboriginal community, and those who taught in the largest Aboriginal tribal community. The largest tribe, Amis, and the smallest tribe, Saisiyat, were included as cases in order to compare and contrast possible size effects with educational provision. The research questions concerned the perceptions of primary school teachers of the recent Taiwanese Aborigine Education Act 1998 and how this Act has changed education in tribal area schools. These two case studies were selected in order to determine whether inter-tribal cultural differences or population size mitigated some of the affects of the Aborigine Education Act policy implementation.

The study design was cross-sectional based on a purposive sample of teachers who taught in the tribal areas in Taiwan. The data were collected by face-to-face questionnaires and semi-structured interviews. The first method involved an extensive survey of the primary schools of the two tribal areas. This survey was personally distributed and administered in

2004. The survey also invited participants to an interview which formed the second data source.

Both the survey and the interview were conducted in Mandarin, as the common language of all citizens of Taiwan. The open ended survey question was transcribed into Mandarin and then translated from Mandarin into English. The English language transcriptions were then input as data into QSR NVivo. There were 607 useful surveys returned. With the permission of each of the participants, the interviews were conducted in Chinese, recorded on audiotape and later transcribed. The qualitative data analysis computer program QSR NVivo 2.0 was used to code and analyse interview data. QSR NVivo permitted the analyses of the Chinese transcript. Several analytical advantages of using the original language are detailed elsewhere (Vallance & Lee, 2005).

How using Different Research Methods can Better Respond to the Research Questions

A mixed methods approach is designed to bring the benefits of several methodologies. According to Frankfort-Nachmias and Nachmias, science is not united by its subject matter but rather by its methodology (Frankfort-Nachmias & Nachmias, 1992). Three perspectives have developed regarding modes of acquiring knowledge. Positivism sees social science as an organized method for combining deductive logic with empirical observations of individual behaviour. Often based on positivism, quantitative research methodology emphasizes the search for facts and causes of human behaviour through objective, observable and quantifiable data. Interpretive social science assumes voluntarism: People have free will to create social meanings. For interpretive researchers, the goal of social research is to discover how people construct meaning. An alternative paradigm argues for moving from positivism to post-positivism. Paradigm here means ‘a set of assumptions about the social world (Gomm, 2004; Punch, 2000, 2004). One of the most common forms of post-positivism is a philosophy called ‘critical realism’ (Sayer, 2000; Trochim, 2002). A critical realist claims that there is a reality independent of our thinking about it and that science can study it.

However, because all measurement is fallible, the post-positivist emphasizes the importance of multiple measures and observations, each of which may possess different types of error, and the need to use data triangulation to obtain a better understanding of social reality (Kimchi, Polivka, & Stevenson, 1991). Punch makes a similar argument. He points out that the differences between interpretive and postpositivist approaches are highlighted in the research literature. These differences may include: the nature of the data; methods for collecting data; and data analyses and interpretations. Nevertheless, Punch contends that these differences ‘should not obscure the similarities in logic, which makes combining the approaches possible’ (Punch 2004, p. 240). Therefore, the researchers can often benefit from combining the two approaches to increase the scope of the research.

Case study research has no specific methods of data collection or of analysis which are unique to it as a method of enquiry (Bassegy, 1999; Stake, 2003; Yin, 2003). Within case studies different methods are used: the semi-structured interview, focus group discussion, document analysis, and survey questionnaire, amongst others. Stake (2003) asserts that the need for triangulation arises from the ethical need to confirm the validity of processes. The mixed methods approach is proposed to add the fabric required, illustrating the depth and flexibility needed to explore the educational issues (Merriam 1998). Mixed methods are a combination of qualitative and quantitative approaches that maintain methodological rigor as well as measures for reliability and validity (Creswell & Miller, 2000; Denzin, 1998; Denzin & Lincoln, 2003b). The mixed methods serve the purpose of triangulation. Denzin asserts

that using multiple data or multiple methods can increase the confidence of the emerging findings (Denzin, 1998). According to Shih, the main purpose of triangulation is to either confirm findings or provide a more complete representation of the subject of study (Shih, 1998).

This research argues for the use of multiple methods to investigate teachers' perceptions. The study of teachers' perception and change of classroom practice is a complex task. Interacting topics require different data to be gathered for different parts of the study. No one data collection method will be able to achieve the desired purpose. Thus, this case study was carried out in two stages, based on two different sources of empirical data: questionnaires and interviews. The results from each stage were used to inform the design of the instruments to be used in the next stage.

In the first stage of this case study, respondents completed a survey instrument. The first part was a demographic questionnaire on their teaching experience and educational background. The second part measured teachers' perceptions of the Aborigine Education Act (AEA). The aim of the second part was to examine the meanings primary teachers attach to mandated nationwide educational reforms, in order to determine teachers' perceptions on the level of implementation of the Aborigine Education Act.

The second stage of the case study was to invite volunteer teachers to participate in individual interviews. The interview schedule was used to gather data by interviewing teachers who volunteered to participate. The interview data was collected parallel with the survey data collection, i.e. between March and June 2004. Due to the research taking place in the middle of the second semester, access to schools was welcomed by the principals rather than during the later examination weeks. Soon after participating teachers completed the survey questionnaires, some teachers wrote down their names in the end of the questionnaire indicating that they were interested in participating in the interviews. Based on that information, an individual appointment was made to conduct a semi-structured interview with each volunteer. Mostly the semi-structured interviews with teachers were done in schools, appointments being made during the lunch break, a non-teaching period, or after school hours. The locations included classrooms, meeting rooms and campus cafeterias. The informed consent forms were signed prior to the interviews. Both parties kept one copy as a record. The duration of interviews ranged from 20 to 45 minutes.

Using empirical data to address the research questions

Teachers are best situated to know about the practice of teaching. Thus, the central research questions are: What are the views of classroom teachers of the policy reform in Aboriginal education? What are the factors which affect individual teachers' responses to change? How are teachers' perceptions expressed in their practice (reform or resistance)? In order to be able to answer the first research question, the following sub-questions also needed to be answered by survey data: 1) Is there a difference between teaching in different tribal communities and teachers' perceptions of Aboriginal education policy? 2) Is there a relationship between gender and teachers' perception of Aboriginal education policy? 3) Is there a relationship between teachers' ethnicity and perceived Aboriginal education reform in Taiwan? 4) Is there a relationship between a teacher's training and perceived Aboriginal education reform? 5) Is there a relationship between teaching experience and perceived Aboriginal education policy? 6) What difficulties do teachers face in relation to policy implementation? As Oppenheim (1999) pointed out, although a large-scale survey is essentially a crude measuring instrument, it does have the advantage of giving an insight into

teachers' attitudes towards important changes in education and it can help identify areas which need further research using more qualitative methods (Oppenheim, 1999). Therefore, the results from the survey questionnaire were used to inform the design of the instruments to be used in the next stage of the semi-structured interviews.

Qualitative data answers the question of whether the policy created reform or resistance at the local school level and how these differences were reflected in classroom teaching. The interviews attempted to understand Aboriginal education through an exploration of primary school teachers' perceptions and perceived practices. Although findings from the survey data and open-ended item provided a 'big picture' of teachers' perceptions of the 1998 Aborigine Education Act (AEA) and related issues, the qualitative inquiry in this case study allowed the researcher to understand 'why' the teachers responded to the policy in different ways. Semi-structured interview questions focused on aspects of the teachers' teaching practices. These questions included previous and current classroom practices; teachers' beliefs and understanding of the Aboriginal education policy; what they perceived to be strengths and weaknesses in the implementation of Aboriginal curriculum; their views on existing Aboriginal language programs; their perception of relationships with Aboriginal families and communities; and the future of Aboriginal education in Taiwan. The next section will discuss the advantages of using the parallel mixed method analysis.

The Argument for Using the Parallel Mixed Method Analysis

This section is organized in the following manner. The first part of this section presents an example of the parallel mixed methods analysis from author's doctoral research. Second, analytic advantages related to the mixed methods design are discussed. The third part explores the problems and analytical strategies to handle analysis issues.

An example of the parallel mixed methods analysis

(1) Findings from survey data

First, the data derived from surveys conducted among the primary school teachers of the 55 primary schools, totaled 607 respondents (response rate 89%). A quantitative survey, using this comparatively large sample of 607 primary school teachers, offered an opportunity to gain a representative sample of primary teachers teaching in Aboriginal tribal areas. This sample enabled the scales measuring teachers' perceptions to be representative of primary teachers in Aboriginal areas. The first part of the statistical analysis examined the frequency distribution of teachers' demographic variables. Second, exploratory factor analysis was used to examine four theoretical scales which intended to measure teachers' perceptions of the policy. Third, the analysis focused on the variables which were associated with teachers' perceptions of the Aborigine Education Act. This analysis was developed by the bivariate analysis, Analysis of variance (ANOVA) and multiple regression.

Seven factors were interpreted and named as follows: Need for AEA, Implementation AEA, Culturally Responsive Teaching, Undifferentiated Teaching, Satisfaction with School Resources, Implementation & Change of Attitude, and Implementation & Change of Pedagogy. The findings were summarised in what follows: The initial research design was a multiple case study, that is, the teachers in the two cases could hold different perceptions about Aboriginal education reform. Based on the data collected, apart from Factor 7 'Implementation & Change of Pedagogy', there were no significant differences for either perception or implementation between Amis and Saisiyat tribal areas. Therefore, the remaining data analysis (i.e. t-test, ANOVA, Pearson's correlation, and multiple regression) analysed the data set as one case study.

Findings from the bivariate analysis show that teachers' perceptions of the policy did seem to vary according to their demographic data. These differences between variables had statistical significance. Firstly, female teachers had more accepting views of the availability of school resources to implement policy than male teachers. Secondly, teachers' ethnic backgrounds reflect their different concerns about Aboriginal education. Regarding the pre-service training, teachers who attended an Aboriginal language course had more positive views on policy than those of teachers who did not take this course. In addition, Aboriginal teachers also reported the importance of being familiar with Aboriginal cultures, and used responsive teaching methods. The findings supported the general trend of findings as reported by earlier studies elsewhere. Fourthly, teaching experience had some effect on teachers' perceptions of Aboriginal education.

(2) Findings from interview data

Second, the interview process also involved different stages of data management. The semi-structured interviews were conducted in Taiwan. The initial data management involved audio records in Chinese, transcribed in Chinese to hard copy, typed as electronic files and subsequently loaded as text into QSR NVivo 2.0 in order to do electronic coding. First, the Chinese transcripts needed to be saved as Rich Text Format (rtf) files, in order to let the NVivo application accurately recognize the text. Second, these rtf files were loaded into QSR NVivo. The following electronic coding and analysis procedure was conducted in Chinese and was comparable to analyzing text in English. Both open coding and axial coding were done within the QSR NVivo application. The final stage of qualitative interview data presentation needed to be done in English for the thesis writing (Vallance & Lee, 2005). Thus, the researcher translated the selected quotations from Chinese to English. The Chinese original of each quotation is displayed in Appendix and is identified in the text with the inclusion of the page number of the English quotation. The research analysis was based on three hierarchical frameworks: codes formed, categories formed, and consequently themes formed. Table 1 provides an example of the process of generating Theme of Policy.

Table 1: *An example of generating codes, categories, and Theme of Policy*

Process	Descriptions
Codes formed	<p>Example 1: 'I felt that the ultimate goal of Aboriginal education is to prepare our students to face the competition in our society, isn't it?' (Quotation from the Interview 19)</p> <p>Example 2: 'I agreed with the view that primary school education should focus on promoting Aboriginal students' achievement'. (Quotation from the Interview 45)</p> <p>The researcher read through all interview transcripts and found that 18 passages out of 48 transcripts covered policy intention explicitly or implicitly.</p>
Categories formed	<p>The commonalities of these codes were grouped together and formed a more abstract concept called a category. The researcher created a category named 'The concept of Aboriginal education' to refer to those nodes. The same procedure applied to the remaining categories.</p>
Themes formed	<p>Themes are higher organization of similar categories. The themes were developed from axial coding.</p> <p>Three categories under the Theme of Policy. These categories are: 'The concept of Aboriginal education'; 'Limited knowledge of Aboriginal education policy'; and 'A lack of supportive policy environment.'</p>

First, the issues related to policy included: policy goals, knowledge of Aboriginal education policy, and supportive policy environment. The second theme that emerged from

the interview data was directly related to teaching practice and curriculum. The third theme discerned from the interview data was related to students' family circumstances and community involvement. Figure 1 shows the key determinants of implementation of the Aborigine Education Act, derived from the interview data.

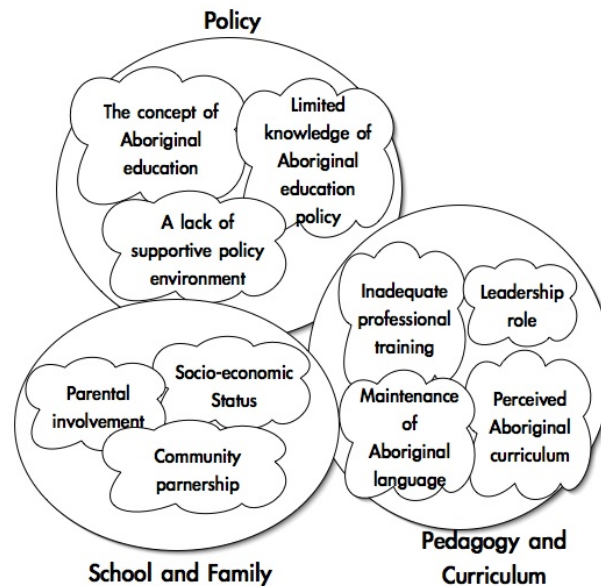


Figure 1: *Themes and categories emerged from the semi-structured interview*

Each broad theme incorporated a number of categories that reflected teachers' concerns, understanding, experience, and knowledge in response to the Aboriginal education policy and the barriers they perceived to their existing work practices. For example, the categories under the 'policy' theme include: the concept of Aboriginal education; limited knowledge of Aboriginal education policy; and a lack of supportive policy environment. The data contained within these themes were then used as a basis from which to construct the study's findings.

(3) Findings from the parallel mixed method analysis

Third, the findings from the parallel mixed method analysis indicate three aspects. Firstly, the main characteristics of the survey sample and the interview sample are comparable, so the researcher argues that the two research sites form the one case study. Secondly, the survey data supported the semi-structured interview data in most aspects, although there were some differences in the findings from the two data sources. Some respondents' perceptions were consistent with theories or previous research literature, such as deficit theory (Ogbu, 1990; Valencia & Solorzano, 1997); professional development (Blair, Paskemin, & Laderoute, 2003; Landt, 2004); and culturally responsive teaching (Malezer & Sim, 2002; Stein, Smith, & Silver, 1999; United Nations, 2004; Weinstein, Curran, & Tomlinson-Clarke, 2003). By discussing their understandings of Aboriginal education in the semi-structured interviews, several participants provided a broader conceptualization of Aboriginal education.

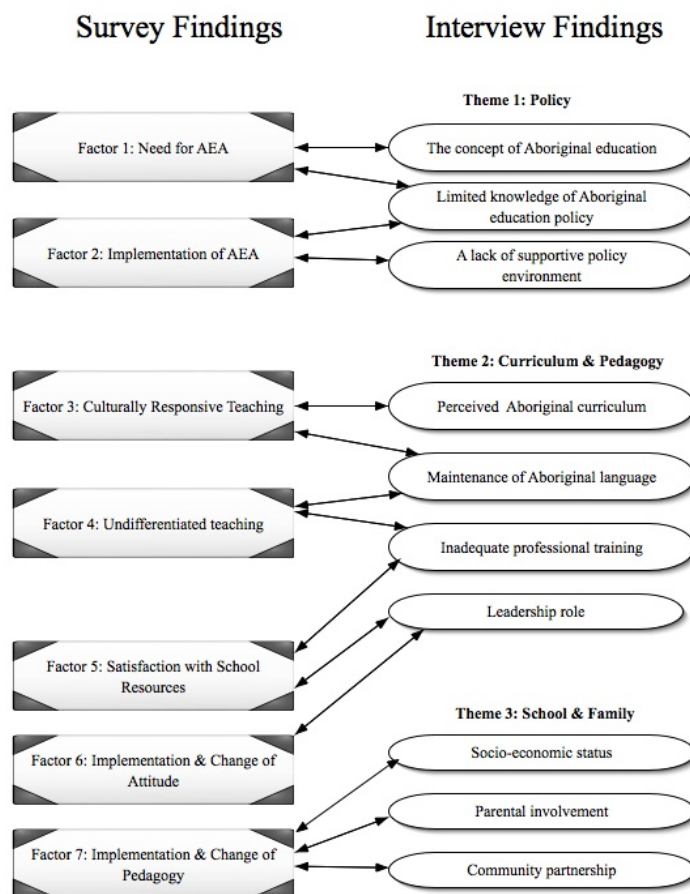


Figure 2: *Concept mapping of the mixed methods analysis*

Figure 2 illustrates the conjunction of findings from both quantitative and qualitative data. For the purpose of the case study, the interview findings are designed to be analysed in conjunction with the survey findings in order to answer three Research Questions. To develop a fuller response to the Research Questions, the researcher decided to develop the discussion based on both compatible and contradictory perceptions on the policy and practice in this section. The lines of Figure 2 indicate relationships between the content of the factors and the categories, and as such the lines do not imply causality. As indicated in the methodology, the case study is the preferred research strategy when ‘what happened’, ‘what does it mean for those involved’ and ‘how something happened’ questions were being asked. And in the case study, the unit of analysis is usually the case itself (Gillham, 2000; Stake, 2003; Yin, 2003). For each of the three Research Questions, the appropriate part of Figure 2 will be reproduced as the discussion develops.

RQ 1: What are the views of classroom teachers of the policy reform in Aboriginal education?

To begin with, the interview data revealed that the contradictory aims of education place considerable pressures on teachers and make their teaching uncertain. The contradictory concepts of what is the possible best practice for Aboriginal people emerged from the interview data. Some teachers understand education policy as framed by a sense of assimilation. Teachers shared a number of perceptions. One group of teachers tended to view education as a means to integrate Aboriginal children into the mainstream society. Another group of teachers tended to the view that education is a vehicle for equalising opportunities. For teachers who held the latter view, the essence of the Aborigine Education Act (AEA) was to promote education equity. In contrast, another group of teachers emphasised the

importance of Aboriginal cultural identity over academic performance. For this latter group, school was not merely the ‘factory of knowledge’ but was to pass on the local community’s unique culture and language. Significantly, ethnic Aboriginal teachers articulated the need for the Aboriginal educational policy in more progressive terms and did so by invoking the need to accommodate Aboriginal students’ learning. To justify their views, some Aboriginal teachers’ portrayed the Aboriginal population as marginalized in Taiwan’s society. For this reason, an improvement of educational quality for Aboriginal children should be put as a priority of policy at the national level.

Figure 2.1 illustrates the conjunctions of findings from the survey and the interviews. At first glance of Figure 8.1, it seems that a contradiction may exist between the teachers’ views of ‘Need for AEA’ from the survey and ‘Limited knowledge of Aboriginal education’ from the interviews.

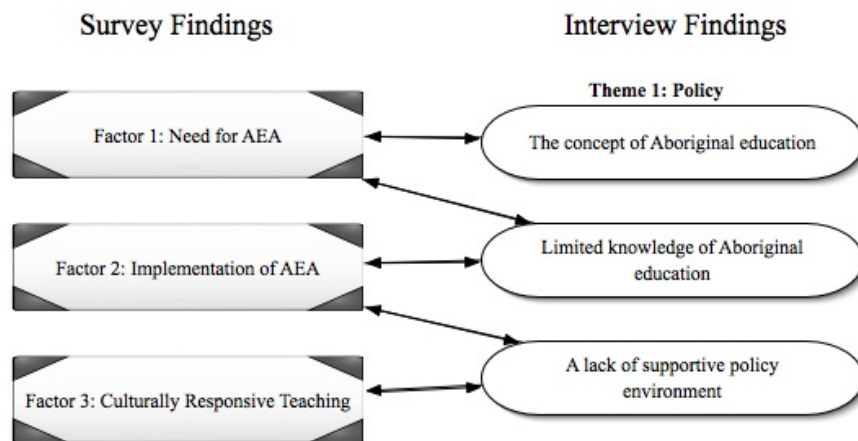


Figure 2.1: *What are the views of classroom teachers of the AEA policy?*

As evidence in the survey findings indicated, almost all teachers’ perceptions of the Aborigine Education Act (AEA) could be classified into one of three broad views: 1) those who take it as a burden and have a negative view; 2) those who are happy that they are doing it and have a positive view; and 3) those who do it just because they have to because it is another institutionalised duty. Findings from interview data are consistent with the survey findings. Among participant interviewees there are conflicting views on what the AEA means for them. Three broad categories of the goals of Aboriginal education were identified: the importance of the preservation of Aboriginal culture, compensatory programs, and the combinations of both above aspects. Taken together, it was anticipated that there might be a consensus within the Aboriginal primary schools to support the policy rather than to confront it. Nevertheless, these respondents’ comments on the policy indicate that there is a conflict of ideas about the goal of policy.

RQ 2: What are the factors which affect individual teachers’ responses to change?

From the survey data, Factor 5 ‘Satisfaction with School Resources’ captures key barriers to effective implementation of Aboriginal education from the perspective of those who taught in Aboriginal primary schools. The research hypotheses are that these variables influence whether teachers take on reform policy or not: gender, teaching experiences, ethnicity, pre-service education training, professional development. Bivariate analyses indicated significant relationships between two variables and the perception of available recourses: gender and ethnicity. Findings also suggest that non-Aboriginal teachers obtained higher scores on the Factor 5 Satisfaction with School Resources than Aboriginal teachers, which meant Chinese teachers were more satisfied with resources than were Aboriginal teachers. In the interviews,

teachers’ accounts are complicated by many issues and these survey variables did not arise in the conversation during the interviews. Figure 2.2 shows the interrelationship of findings relevant to the Research Question 2 in this case study.

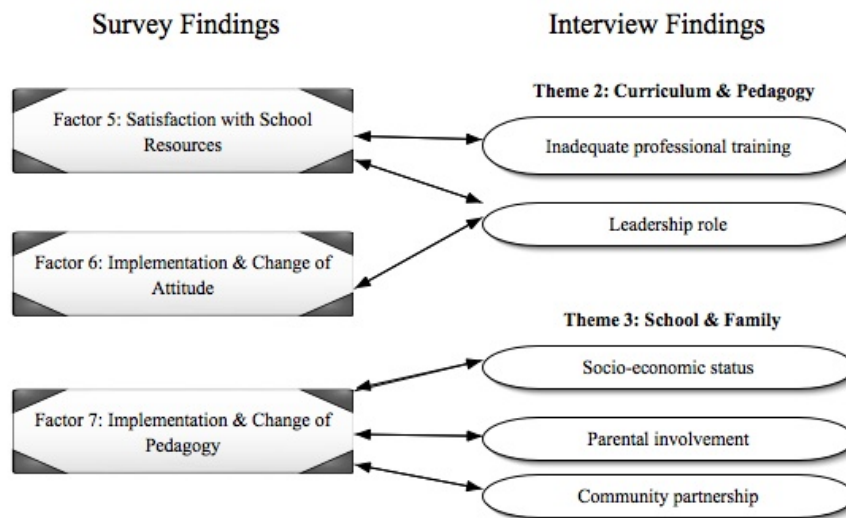


Figure 2.2: *What are the factors which affect individual teachers’ responses to change?*

In Figure 2.2, although participants’ views raise many issues that are important for the researcher to consider, the interpretation focussed on three concerns in particular: the relationship between resources and implementation of AEA; change of teachers’ attitudes toward the Aboriginal curriculum; the relationship between school and family.

RQ 3: How are teachers’ perceptions expressed in their practice (reform or resistance)?

Another area this study investigated is how the primary school teachers incorporate the ideals of a better educational service for Aboriginal people. Figure 2.3 illustrates how teachers’ perceptions expressed in their practice are divided into two aspects evidenced in some teachers’ survey response and interview conversations. Firstly, teachers reported that they applied culturally responsive teaching to their everyday classroom practice. They described their capacities to consider and evaluate multiple cultural perspectives; and abilities to collaborate effectively in a mixed ethnicity classroom. Secondly, teachers described how they treated students equally and without prejudice regardless of their ethnic background. This teaching practice was labeled as ‘Undifferentiated Teaching.’

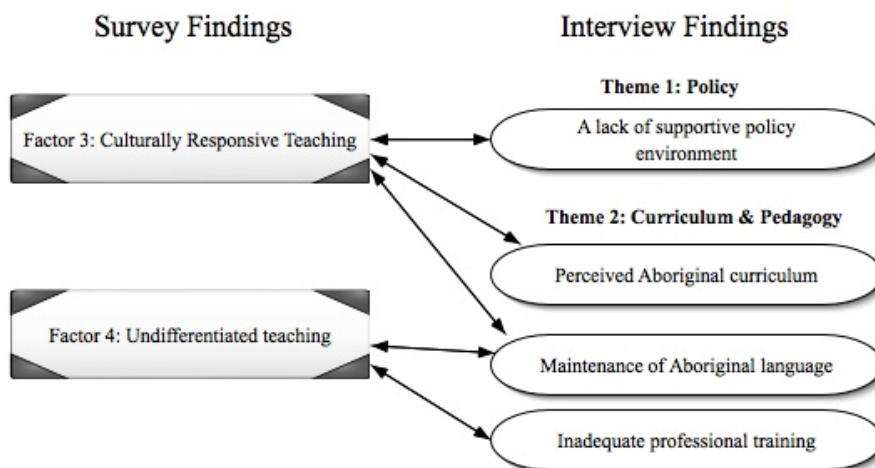


Figure 2.3: *How are teachers' perceptions expressed in their practice?*

To respond to the third research question, it was necessary to identify culturally responsive teaching and undifferentiated teaching approaches. In summary, findings suggest that teachers' perceptions are expressed in their classroom practice in several different ways. They would seem to divide on their views of classroom practice into multiculturalism true believers and those who embrace an undifferentiated approach. In this case study, a majority of participants fall into the latter category.

The procedures described above are relatively summary. According to the literature on empirical research, regardless of the type of research, validity and reliability are concerns that can be approached through careful attention to a study's conceptualization and the way in which the data were collected, analysed, and interpreted, and the way in which the findings are presented (Creswell & Miller, 2000; Denzin, 1998; Merriam, 1998; Vallance, 2004; Winter, 2000).

This article argues that there are at least two advantages when the analysis is done in the mixed methods approach. The first advantage is to maintain methodological rigour. The second advantage of using mixed methods analysis is a more holistic analysis. The significant analytic advantages of using the parallel mixed methods and analysis rather than working in a single method are now explored.

Methodological rigour

Mixed methods are a combination of qualitative and quantitative approaches that maintain methodological rigor as well as measures for reliability and validity (Creswell & Miller, 2000; Denzin & Lincoln, 2003a). This includes two issues: reliability and validity of the research instrument (i.e. attitude scales), and reliability and validity of the interview findings.

(1) Reliability of scale scores

Analysis of the reliability of the survey instrument showed that seven factors were extracted from four theoretical scales through exploratory factor analysis. Exploratory factor analysis was used to develop unidimensional scales: being unidimensional these scales measured only one trait. High internal consistency indicates high statistical reliability of the data. The Cronbach's alpha for five factors ranged from .66 to .81 (M. Lee, 2005). While the results show that the scales yielded satisfactory internal consistency in general, two factors (Implementation AEA and Undifferentiated Teaching) need further assessment to improve internal consistency. For instance, the second factor 'Implementation AEA' has a low Cronbach's alpha coefficient ($\alpha=.24$) which means that the scale needs to be improved. In part, the low alpha coefficient could be due to the small number of items in the scale.

Other considerations for evaluating the reliability of scales suggested by de Vaus (2002) are: 1) have a set of questions to measure the one concept; 2) pilot-test of questions; 3) other methods of improving reliability involve careful question wording, and working out methods of a coding scheme (de Vaus, 2002). In this case study, the 36-item Perception of Aboriginal Education Scales was developed to assess the latent variables about teachers' perceptions on the following areas: policy, multiculturalism, resources and classroom practice. The initial questionnaire was developed through a process of pilot-testing with a sample of 48 teachers outside the study sample in 2003. The preliminary analysis of the pilot study aimed at examining: 1) whether there are extreme items at either end of the continuum, 2) whether the

items of the Likert scales highly correlate to each other, and 3) modifications of question wording and the establishment of consistent coding schemes based on response from the pilot study. Hence, the scales met de Vaus's three criteria for evaluating the reliability of scales.

(2) Validity of scales

With respect to the validity of the survey instrument, the issue was whether the scales were measuring what they were planned to measure. As indicated in the second section, Methodology, the questionnaire was based on previous literature on the teacher's attitude toward Aboriginal education, multiculturalism and reform policy. The literature provided the substantive topics of the survey questions. To develop a valid instrument, the survey questionnaire has been verified by conducting a pilot study in 2003. The pilot study results showed that the attitude scales were basically sound. Where the pilot study indicated that a question was potentially a leading question, an insufficiently introducing question, or an ambiguously worded question, the question was more appropriately worded.

In this case study, the evaluation of the validity of scales was satisfactory for four reasons. Firstly, as mentioned previously, the methods of translation and back translation were adopted to ensure the validity of the scales – Chinese version. Secondly, Kaiser-Meyer-Olkin measure of sampling adequacy was .847 which could be accepted as good. Bartlett's test of sphericity was significant (Lee 2005, p.106). Both tests supported the correlation matrix based on the survey data as suitable for factor analysis. Thompson (2004) identified two major classes of factor analysis, namely, exploratory factor analysis and confirmatory factor analysis (Thompson, 2004). Since the present instrument was newly constructed, EFA was an appropriate tool with which to develop the unidimensional attitude scales. de Vaus (2002) asserts that construct validity is one of basic ways to assess validity. Construct validity evaluates a measure by how well the measure confirms with theoretical expectations. The results of EFA partially supported the theoretical scales constructed by the researcher based on the previous research literature. Thirdly, the researcher made a case for the triangulation of the data. The findings suggest that the intended objectives have been achieved. Figure 8.0 illustrates the interactive relationships between the survey findings and the interview findings. This can enhance our understanding of the teachers' perspectives and perceptions. Lastly, in considering the high response rate (89%), each scale item has proven to be relevant to the proposed objectives of the measurement of Taiwan's teachers' perception of the Aboriginal education policy.

While the survey instrument was subject to intensive investigation, the lack of survey questions exploring student discipline limited the instrument's validity. This limitation pertains to a comprehensive view of teachers' perception about Aboriginal education. Results of the exploratory factor analysis suggested that greater emphasis must be also put on factor of student discipline issues in the construction of future teachers' attitude scales. From the perspective of classroom teachers in the survey sample, student behavior problems or discipline issues may play an important part in their efforts to improve student's learning. For instance, previous research suggests that at-risk students, often may be Aboriginal students, are less likely to learn, so that teachers would spend much time on student behavior problems (Howard 1998; Partington et al. 1999; Young 1999) (G Partington, Richer, Godfrey, Harslett, & Harrison, 1999; Young & Graham, 2000). Thus, discipline issues in the context of Aboriginal education could be constructed as another theoretical subscale in any further research.

(3) Reliability of qualitative interviews

To establish the reliability of the interviews, the research processes need to be examined. In July 2003, the researcher conducted a pilot study for two reasons. The first was to verify the semi-structured interview schedule. The second was to improve the researcher's interview skills. Interview quality is achieved partly on the basis of researcher's interview skills (Berg, 2004; Denzin & Lincoln, 2003a; Rubin & Rubin, 1995), and partly on the basis of participants' engagement in the interview conversations. In considering the teachers' feedback, the number of teachers who were interested in participating in the interview exceeded the researcher's resources. Such positive feedback from teachers was presumed to reflect their high levels of interest in the topic. Four explanations may answer the question - why were these teachers willing to talk with me? 1) the topic is relevant to teachers' concerns, i.e. it is relevant to their teaching practice; 2) it is worthwhile to be sensitive to the cultural issues such as tribal community culture and school culture. After all, research ethics are a matter of principled sensitivity to the rights of others; 3) teachers had something about the topic they wanted to say, they cared about developing good practice; 4) these participant teachers cared about whose interests were served or denied by the research project. For the semi-structured interviews, the questions were related to the teachers' views on the education policy document and their professional practice. Therefore, the interviews were unlikely to pose a potential hazard to participants. The benefit that this research offered to participants was that the identification of teachers' perceptions may enable the reform of education to be better promoted and encouraged.

(4) Validity of interviews findings

An important issue raised in the case study was the transparent interpretation of findings required in the semi-structured interview reports. As detailed in the second section, Methodology, the researcher used computer assisted qualitative data analysis software (CAQDAS) QSR NVivo 2.0 to maximise the potential analytic rigour of the qualitative interviews (Seale, 2003). NVivo permitted the analysis to be performed in the original Chinese. There are three analytic advantages of value when the analysis is done in the original language: accurate analysis, holistic analysis, and nuance analysis. Each of the analytic advantages is predicated on a foundational understanding of qualitative analysis (Vallance & Lee, 2005). When discussing the application of qualitative research and case study in education, Merriam (1998, p. 202) also asserts that '... reality is holistic, multidimensional, and ever-changing.' Thus, keeping close to the text is part of the argument for validity. It is argued that the text should be as close as possible to the original interview event, and hence should be in the original language, i.e. Chinese. Keeping close to the text is part of the argument for validity (Minichiello, Aroni, Timewell, & Alexander, 1990), and the difficulty explored in this article is: what forms the text? The response is argued to be that the text should be as close as possible to the original interview event, and hence should be in the original language.

This case study report claims to be a fair presentation of interviewees' accounts through two ways. One step is to demonstrate a fair representation of each interviewee's account and to report the frequency with which each interviewee is quoted. The frequencies of each cited interview conversation was summarised (Lee 2005, p.172). One method to enhance the validity of qualitative reports is to report effect sizes associated with qualitative observations. In its simplest form, effect sizes in qualitative research represent counts of observations or themes (Onwuegbuzie & Leech 2004). A second method employed in this report is to provide the Chinese original of each quotation, displayed in Appendix. In so doing, readers can refer to the original interview extracts as well as to the translated version in the text.

Holistic analysis

The second advantage is a more holistic analysis. The term holistic analysis refers to the sense that the findings are not reported in separate ways. The holistic analysis centers on one aspect: responding to the Research Questions by integrating the factor analysis of the quantitative data with the themes that emerged from the qualitative data. The case study is an increasingly accepted means to build theoretical positions (Eisenhardt, 2002). Meanwhile, the case inquiry 'relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result' (Yin 2003, p.14). Education researchers are increasingly combining qualitative and quantitative methodology in order to understand more fully the world of research subjects (Capella-Santana, 2003; Coyle & Williams, 2000; Patrick & Middleton, 2002; Strauss & Corbin, 1990; Tashakkori & Teddlie, 1998). These writers claim that qualitative data are often used to explore the subjective meanings.

In the first stage of data analysis, the researcher reported the different data types separately. Firstly reporting the findings from the survey data, and secondly presenting the recurrent themes from the interviews data. The second stage is then turns to concentrating on building a linkage between the different types of evidence and the Research Questions by triangulating two sources of findings (cf. Figure 2). As the research questions focus on primary school teachers' perception of policy, the decision was made to use the data gleaned from survey questionnaires as the central emphasis of the analysis. From there, an attempt was successfully made to triangulate the findings made from the teachers' survey data, as well as from the semi-structured interviews. The data presentations of the case study aim to deepen and broaden the understanding of the complexity of intended policy outcomes and the teachers' interpretation and implementation of this policy.

Mixed methods analyses were used to gain a better understanding of the resource provided for classroom teachers, and the barriers, for them to implement the policy. Insights from qualitative data help researchers to design instruments which are more sensitive to respondents' meanings. Qualitative methods foster the interpretation or the better understanding of phenomena reported in surveys. This process allows for the triangulation of qualitative and quantitative data. This study aims to describe how primary school teachers have reacted to the process of aboriginal education reform in Taiwan. Accordingly, this research is designed to triangulate its methodologies by combining quantitative analysis of the teachers' perception of the Aborigine Education Act and qualitative analysis of how teachers change their classroom practice. It is important to note that the findings of this case study are not going to easily generalize outside the case. However, the researcher attempts to link teachers' perceptions with these changes of practice in Taiwan by providing empirical evidence. In other words, the study assesses the changes that have occurred in classroom practice to promote Aboriginal education.

Many writers on the validity of empirical research contend that every component and stage of a research can be examined for validity, and this includes design, measurement, data collection, analysis, interpretation and writing (Berg, 2004; Johnson & Christensen, 2000; Johnson & Turner, 2003; Maxwell, 1992; Neuman, 2000). As detailed in research design, measurement, and the procedure of data collected have been fairly reported. The research planned in the qualitative interviews was to examine teachers' personal views of and challenges in teaching Aboriginal students. Results indicated that three themes were uncovered from the interview data, which echo findings from the survey findings (cf. Fig. 2.0). Overall, the findings from the interview data indicate that a gap exists between policy and practice which may hinder the effective implementation of policy. Highlighted amongst

the lessons learned from the interviewees' experience is the insensitivity of policy to the practical realities of the classroom. Many issues addressed in the survey instrument became topics of conversation in the interviews. These enabled the researcher to triangulate the findings from the survey data. Thus the analysis offers an improved opportunity to develop an analysis that respects the whole world view of the participants, and hence in this sense is a holistic analysis.

Problems of combining numerical data and interview data

Are there analytic disadvantages in the process described? It is possible that at least one disadvantage do exist. Some difficulties occur in handling data analysis issues. It is often not easy to determine from the limited guidelines available for handling analysis and interpretation issues (Shih 1998). Nevertheless, the strength and character of the case study has much to do with the multiple sources of evidence and a holistic interpretation of the educational phenomena under study. Thus, the role of the researcher is to make every effort to apply the knowledge gained from personal research experience and from the methodological literature to enhance reliability and validity for this case study.

Conclusions

This article presents two main arguments. First, in order to better respond to the research questions, the above mixed methods analysis was applied to identify key findings from this case study (cf. Figure 2.0). In particular, the qualitative approach focused on the deep subconscious bias that may shape participants' perceptions and contribute to change in classroom practices. Second, it is argued that there are at least two advantages of using the parallel mixed methods analysis. The first advantage is to maintain methodological rigour. The second advantage of using mixed methods analysis is a more holistic analysis. Both aspects increase the potential of the trustworthiness of the research outcomes.

Findings of the case study summarized above provide an elaborate understanding of the theoretical and procedural aspects of the mixed methods analysis, and analytical strategies required to answer the research questions. Findings suggest that there is a problem with defining Aboriginal education itself. The family effect has profound implications for students, for educators and even for policy makers.

In conclusion, as educators and researchers, it is important to closely examine these issues to better understand the pressures facing Aboriginal people and the barriers to balancing academic learning with maintenance of culture in Taiwan. The 1992 Nobel Peace Prize winner Mayan Rigoberta Menchu indicates a lesson we could learn from the Aboriginal people:

The constitution speaks of protection for the indigenous ... It is not only political, cultural and economic marginalization, it is an attempt against the dignity of the majority of the population. The human being is to be respected and defended, not protected like a bird or a river. (Porras & Riis-Hansen, 1992)

This brief excerpt captures much of the voice of Aboriginal populations around the world including those of Taiwan: a quest for dignity.

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