# 行政院國家科學委員會專題研究計畫 成果報告

## 尋找原住民女性科學教師的典範--原住民女性科學教師專業啟蒙的探勘
## 研究成果報告(精簡版)

計 畫 類 別 ：個別型
計 畫 編 號 ：NSC 100-2629-S-017-002-
執 行 期 間 ：100 年 09 月 01 日至 101 年 08 月 31 日
執 行 單 位 ：國立高雄師範大學工業科技教育學系（所）

計 畫 主 持 人：楊宏仁
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報 告 附 件 ：出席國際會議研究心得報告及發表論文

公 開 資 訊 ：本計畫可公開查詢

中 華 民 國 101 年 09 月 07 日

中 文 摘 要 ： 教師是如何成為教師？怎樣的啟蒙，讓教師踏進師資培育體系？原住民女性科學教師具有多重且複合的角色，繼承原住民族的文化血脈，在教育上，負有族群文化使命的傳承，而在文化與個人需求的交融下，是什麼樣的原因讓原住民女性科學教師進入師資培育體系，並選擇投入科學領域內進行學習，便值得令人探尋。本研究擬探究原住民女性科學教師專業啟蒙的情形，了解專業啟蒙的觸發因素，獲得原住民女性科學教師踏入師資培育體系的原因，並探討制度對於專業啟蒙的影響及師資培育的情形與過程。藉由量化與質性的研究方法，探究原住民女性科學教師在師資培育體系中專業啟蒙的形塑與養成歷程，以了解專業啟蒙特質，構築原住民女性科學教師專業啟蒙的典範。

中文關鍵詞： 原住民女性科學教師、專業啟蒙、師資培育制度

英 文 摘 要 ： How does a general person become a teacher? What kind of professional initialization could support teacher preparation? Native female science teachers' multiple roles had inherited the blood of indigenous culture. Their education professional also play a role to extend ethnic culture. The blend of both culture and individual needs force them become a science learner in the professional science teacher preparation program and also a science teacher in the teaching professional field. The purpose of this study would explore the Professional enlightenment of Native female science teacher, understand their trigger factors, find out their reasons of entering teacher preparation program, figure out the effect on Professional enlightenment caused by preparing system's and also the status and procedures of Native female science teacher preparations. By applying the both quantitative and qualitative research methods, it is hoped that the paradigms of Professional enlightenment would be identified in detail with their formational characteristics, growing process, specialties enlightenment and professional growing motivations.

英文關鍵詞： Native female science teachers, Professional enlightenment, teacher education system

# 行政院國家科學委員會補助專題研究計畫 ☑成果報告 □期中進度報告

## 尋找原住民女性科學教師的典範—

## 原住民女性科學教師專業啟蒙的探勘

計畫類別：☑個別型計畫　□整合型計畫
計畫編號：NSC 100－ 2629 － S － 017－002－
執行期間：2011 年 09 月 01 日至 2012 年 08 月 31 日

執行機構及系所：國立高雄師範大學工業科技教育學系

計畫主持人：楊宏仁
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計畫參與人員：林學智、何妙桂、

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中　華　民　國 100 年 8 月 31 日

# 中英文摘要及關鍵詞

## (一)中文摘要

教師是如何成為教師？怎樣的啟蒙，讓教師踏進師資培育體系？原住民女性科學教師具有多重且複合的角色，繼承原住民族的文化血脈，在教育上，負有族群文化使命的傳承，而在文化與個人需求的交融下，是什麼樣的原因讓原住民女性科學教師進入師資培育體系，並選擇投入科學領域內進行學習，便值得令人探尋。本研究擬探究原住民女性科學教師專業啟 蒙的情形，了解專業啟蒙的觸發因素，獲得原住民女性科學教師踏入師資培育體系的原因，並探討制度對於專業啟蒙的影響及師資培育的情形與過程。藉由量化與質性的研究方法，探究原住民女性科學教師在師資培育體系中專業啟蒙的形塑與養成歷程，以了解專業啟蒙特質，構築原住民女性科學教師專業啟蒙的典範。

關鍵字：原住民女性科學教師、專業啟蒙、師資培育制度

## (二)英文摘要

How does a general person become a teacher? What kind of professional initialization could support teacher preparation? Native female science teachers' multiple roles had inherited the blood of indigenous culture. Their education professional also play a role to extend ethnic culture. The blend of both culture and individual needs force them become a science learner in the professional science teacher preparation program and also a science teacher in the teaching professional field. The purpose of this study would explore the Professional enlightenment of Native female science teacher, understand their trigger factors, find out their reasons of entering teacher preparation program, figure out the effect on Professional enlightenment caused by preparing system's and also the status and procedures of Native female science teacher preparations. By applying the both quantitative and qualitative research methods, it is hoped that the paradigms of Professional enlightenment would be identified in detail with their formational characteristics, growing process, specialties enlightenment and professional growing motivations.

Keywords: Native female science teachers, Professional enlightenment, teacher education system

## 前言

教師是如何成為教師？怎樣的啟蒙，讓教師踏進師資培育體系？天下雜誌（1998）曾做過一份調查，結果顯示中小學教師當初選擇教職的原因依序為工作環境單純(61.9%)、收入穩 定(52.6%)、喜歡與學生相處(41.1%)、家人與朋友的影響(40%)、假期穩定(31.8%)、有教育理 想(31.7%)與聯考分發志願(11.1%)。楊淑玲（2001）研究指出，大部分的原住民女學生期望將 來能到原住民小學任教，並期許自己未來教學時，能讓原住民學生多接觸自己的文化。林益 慶（2000）在探討國小教師當初選擇教職的因素時發現，就族群而論，原住民教師選擇教職 時比閩南籍教師不在意「現實考量」和「教職吸引」而 Piercynski 與 Matranga 等人以深度訪 談方式訪問美國內華達州鄉村 19 名從事教育工作的少數族群教師,發現這些教師從事教育工 作多受到先前教師的影響,或者受到自身家庭的影響引自周聖珍,2000》在任教承諾方面， 林益慶（2000）及吳育哲（2001）的研究中，亦指出原住民籍師院生有高度的任教承諾。周 聖珍(2000)談到，身為原住民教師，繼承著原住民族的文化血脈，對族群教育的表示關懷，顯示原住民教師對於教育負有族群文化使命的傳承，在任教動機與意願上，更值得關注。

聯合國文教組織推動性別主流化的主要工作項目之一便是提倡科學應有更多的女性以及弱勢團體的參與（蔡麗玲，2007），而本計畫的研究對象為原住民女性科學教師，具有多重 且複合的角色，並多被視為是少數又弱勢的，對於非全然為父系社會且是多元族群的原住民 族而言，文化背景脈絡對於教職場域專業啟蒙影響情形，以及透過制度到進行培育的過程， 探究原住民女性科學教師師資培育體系中專業啟蒙特質的形塑與養成歷程，以了解專業啟蒙的特質，構築原住民女性科學教師專業啟蒙的典範。

## 研究目的

本研究擬以三年段來完成目的主要分為四點：

一、探究原住民女性科學教師師資培育體系中專業啟蒙特質的形塑與養成歷程。
二、了解原住民女性科學教師透過制度進入師資培育體系的情形。
三、了解原住民女性科學教師進入師資培育體系的動機與看法。
四、形成原住民女性科學教師專業啟蒙的典範。

第一年段：原住民女性科學教師專業啟蒙情形調查，建構模式達成下列各項：

1. 蒐集與分析原住民女性科學教師進入師資培育體系相關文獻。
2. 分析與探究原住民女性科學教師背景資料與其他變項之間的關係。
3. 整合與分析原住民女性科學教師進入師資培育體系的動機與看法。
4. 整合與探究原住民女性科學教師對於師資培育教育的制度及學習上的看法。
5. 了解原住民女性科學教師進入師資培育體系的方式與途徑。
6. 整合原住民女性科學教師專業啟蒙整體量化統計資料分析。
7. 與各子計畫探討原住民女性科學教師典範的項目、架構及內涵。
8. 原住民女性科學教師專業啟蒙典範模式形成。

## 文獻探討

Lortie 提到教職與其他工作相比至少有兩項特殊性：(1)很少職業能提供像教職一樣與學童長時間接觸的機會;(2)很少職業能像教職般有十分規律的工作時間表（引自林益慶，2000）。林益慶（2000）指出，大部份教師均同意教職是一項有價值的，卻非輕鬆容易的事， 然而，時至今日，教師這份工作仍是吸引著不少的人投入。

在教職工作的選擇上， Ryans 發現教師選擇教職有兩個因素：(1)教學工作具有公眾性及 社會服

務的特性；(2)教職具有知性的本質。另外 Moffatt 探究教職選擇的因素時，也發現兩 點：(1)與年輕人一起工作的欲求；(2)教育對社會的價值（引自林益慶，2000）。Montecinos 與 Nielsen(1997)探究主修小學教育大學生選擇教職的理由，主要有三個：(1)對孩童的奉獻； (2)以前和孩童一起的工作經驗：(3)受求學過程中好老師的影響。而在林益慶（2000）的研究 結果中發現，無論在性別、取得正式教師資格的方式或是不同年齡層的教師，當初在選擇以 國小教職為業主要在於個人志趣的考量，其次則是教職工作的外在吸引力。可以見得，選擇 投入教職的因素有著多元的面向，因個體對於教職的觀念而有所不同。

在任教意願方面，張芬芬（1984）提出，任教意願是個人願意擔任教師，從事教學工作 的歷程，是基於對教師工作的認識，經由個人選擇工作的動機配合，產生對教職的好惡，而 後顯現出趨向或逃避教職的行為，將任教意願界定為認知成份、情感成份及行為成份。王以 仁（1992）則將師院生任教意願歸納為內、外在層面，內在層面包含工作意義和工作安定兩 個因素，而外在層面則有父母的期望與現實因素。鍾任琴（1994）則進一步說明內、外在層面的內涵：

1. 內在層面：喜愛兒童、服務利他、自我興趣、成就感、自我實現、工作價值。
2. 外在層面：工作環境與條件、工作安定、升遷機會、報酬待遇、社會地位、假日多以及符合他人期望。

劉春榮、吳清山、陳明終、林天祐、方慧琴（1997）的研究顯示，選修教育學程以及師範體系的學生，其任教意願包含四個面向：

1. 工作有意義：包含喜愛看到學生的成長、教學能幫助他人過更好的生活、教學 能改變他人的氣質、能將社會精神傳承至下一代。
2. 工作安定：生活安定、工作有保障、薪資引人、工作同仁和諧、工作場所有制 度、工作環境單純、工作地與家庭的距離可以較近。
3. 工作興趣：嚮往教師工作、工作符合自我興趣、工作可以發揮專長、繼續研究 自己喜歡的科目、教學可鄉長、可發揮自己的才華、喜歡與年輕人相處。
4. 現實因素：教師社會地位高、符合他人的期待、在公家任職是家庭追求的目標、 有獻身教育的機會、在教改聲中負擔責任、增加就業機會、教師是熱門的行業。

可以見得，研究對於任教意願的因素歸納是相近的，而事實上，教職工作的選擇與任教 意願是具有一體兩面的關係存在，因不同的目的投入教職，也影響著任教的意願與對教育工 作的投入。在原住民教師方面，周聖珍（2000）談到，身為原住民教師，繼承著原住民族的 文化血脈，對族群教育的表示關懷，顯示原住民教師對於教育負有族群文化使命的傳承。卯 靜如（2004）亦認為，女性選擇教職的原因交織著經濟環境與文化脈絡而變得多元，且不同 族群與階級背景，更複雜化了女性選擇教職的原因。而楊淑玲（2001）的研究中指出，大部 分的原住民女學生期望將來能到原住民小學任教，並期許自己未來教學時，能讓原住民學生 多接觸自己的文化。林益慶（2000）及吳育哲（2001）的研究亦提到原住民籍師院生有高度 的任教承諾。顯現原住民教師對於教職的選擇具有較高的任教意願之外，並具有承諾性，擁有族群文化維護的使命，影響著原住民從事教職工作的因素。

社會傳統對女性的要求依然停留在身體吸引力、養育、感性、依賴；對男性則是統治、成就取向、理性、和果斷（黃幸美，1995），影響著性別在職業上的選擇。謝小岑（1995） 也談到，由於教職與母職性質相近，成為社會所認同適合女性的工作，也是女性步出家庭走 入公共領域的重要管道。因此，

教書是「女性的工作」更顯得是理所當然，Kaestle(1983)指 稱，學校組織教學女性化，形成教學中「性別取向化階層」的情形。Feiman-Nemser 與 Flodan(1986)便認為，教學工作女性化無法避免在社會上產生的偏頗文化刻板印象，持續對女 性教師的期望與她們的自我期許，有負面左右的力量。也就是說，該現象隱含著迥異的負面 意義，因為將教學化分為女性工作，但充斥貶抑女性的負面觀念及刻板印象，Cosslett, Easton 和 Summerfield(1996)的研究指出，女性教師泰半擔任照顧與家務性職務，教授的內容偏重人文、社會與生活科學；男性教師則從是身體的勞動及權力的執行。而在教師文化中早已衍生出男性教師文化優於女性教師文化的價值判斷（李曉蓉，2003）。

陳薇如（2004）便認為教育是性別隔離的職場，觀察在教育職場性別比例可以發現，中 等以下學校教師以女性占多數，且隨教育等級之提高，女性教師所占比重則反向減少，98學 年度國中小女性教師比重約占7成、高中占6成、高職約占5成2（陳曉佩，2009）。長久以來女 性教師在高中職以下各級學校所占比率均超過半數，然而，各級學校校長的性別比率有著相 當大的懸殊，是男性多於女性（陳榮昌，2008），驗證著教育場域的確為性別隔離的職場的說法。

不過，根據97學年度的教育統計，原住民女性教師約占5成2，全體女性教師占5成9，原住民教師性別差異較全體教師小，但原住民女性教師多集中於國小，占7成1，國小原住民教 師女性比率稍高於男性，其餘各級學校皆低於男性（羅惠丹、許雅玲，2010），顯著與整體 統計有著不同的情形。或許女性與教職在原住民族的文化中，並未如非原住民族群那麼的截 然區隔著，加上原住民族群並非全然的父系社會，亦有可能影響性別職業上選擇，並具有彈性與空間，也導引原住民女性科學教師專業啟蒙的思考。

從十七世紀「啟蒙」以來，歐洲中心主義的「現代科學」，其發展的軌跡與製造的科學論述便與性別論述相糾纏。理性、客觀等概念逐漸發展成為科學社群所獨尊的科學論述，成 為現代科學的基礎；同時，歐洲社會亦發展出一種社會論述，宣稱男性較理性、較客觀、女 性較不理性、較不客觀。此兩種論述相互作用，漸漸把科學攬成男性專擅的事業，將女性排 除在外，或說，將女性「她者化」（蔡麗玲，2003）。Ruth(2007)也談到，科學長久以來被視 為是「男性化」，而在教育中該議題也受到忽視。至今，兩性在性別比例上仍存在著「男主理 工，女主人文」的傳統性別區隔（黃幸美，1995）。傳統觀念認為女性的聰明才智平均低於 男性，特別是數理、邏輯與空間概念，因而常被認為不適合學習科學和工程，所以長久以來 科學與工程一直被認為只適合男性，並由男性主導和控制（戴明鳳，2007）。性別的傳統謬 論，是難以跨越的傳統性別思維，並且將性別職業進行了隔離，成為女性在職業選擇上的障 礙。女性在科學的歷程發展上，戴明鳳（2007）便談到，諾貝爾獎自1901年開始頒發以來， 至今有761人分別獲得不同領域的獎項，但其中女性僅有34位獲得榮耀，佔總獲獎人數的4.4%，佔有率不到5%。且多數女性科學家大多與男性學者一起獲獎，分享榮耀。顯示女性在科學的發展上，仍屬於相對的弱勢。而在拜爾公司的科學教育調查研究報告顯示，與科學、科技、工程、數學領域相關的工商業界，女性及少數族裔等弱勢族群必須投入更多的努力， 才能順利進入職場（教育部電子校園報，2010）。吳淑敏（2008）整理相關研究時亦指出，男 性在數學與科學領域占絕大多數，女性在這些領域只有非常小的比例，即使女性主義抬頭， 女性在科學領域的議題愈來愈受到關注，但是問題仍然存在。

然而，在我國相關統計方面顯示，98學年度大專校院原住民學生就讀學科性別比較顯示， 原住民女性學生在人文及社會類之比率超過6成，但就讀科技類的原住民女性（共3,687人）， 高於原住民男性的3,221人，占53.37%（羅惠丹、許雅玲，2010）。顯示原住民學生在科學活 動上，或許與非原住

民族的選擇有所不同，亦影響到未來在職業的選擇。因此，可以對原住 民女性科學教師進行深入的探討，了解原住民女性科學教師其專業啟蒙情形，供作為培育學生在科學發展的基礎。

原住民女性科學教師具有多重但卻屬於各個群族中的少數甚至被認定為是弱勢的一群，對於教職的選擇其專業啟蒙脈絡亦有些不同。林益慶（2000）將國小教師當初選擇教職時所 持的理由分為五個因素：分別是「個人志趣」、「現實考量」、「教職吸引」、「重要他人」以及「未來發展」，且就族群而論，原住民教師選擇教職時比閩南籍教師不在意「現實考量」和「教 職吸引」。而 Piercynski 與 Matranga 等人以深度訪談方式訪問美國內華達州鄉村 19 名從事教 育工作的少數族群教師，發現這些教師從事教育工作多受到先前教師的影響，或者受到自身 家庭的影響（引自周聖珍，2000）。可以發現原住民教師選擇教職工作的專業啟蒙具多元性。 另一方面我們要了解的是，原住民民族並非全然的父系社會，因而，對於原住民女性科學教 師專業啟蒙過程的認識便值得我們更進一步去探討。

從法源基礎來看，民國 83 年憲法增修正式承認「原住民」的地位並維護其族群文化；87 年「原住民族教育法」公佈，提供原住民族教育的合法性基礎與權利保障。在體制方面，民 國 85 年中央部會成立「行政院原住民委員會」；87 年原住民民族學苑籌備處於東華大學成立， 今為「原住民民族學院」。且另有師範院校成立原住民教育中心；政府在高等教育機構亦鼓勵 原住民相關研究；政府或民間自發性的原住民教師研習，及原住民刊物的發行，都顯示原住 民族群及教育文化有長足的發展(周聖珍，2000）。而在原住民師資培育制度方面，民國 93 年修正並公布的原住民族教育法（2004）中提到，其目的在保障原住民之民族教育權，以發展原住民之民族教育文化，而特別制定。在原住民師資培育方面規定，主要有五項：

（一）各師資培育之大學招生，必須保留一定名額予以原住民學生，並得依地方政府之 原住民族教育師資需求，提供公費名額或設師資培育專班，以保障原住民族教育師資之來源。

（二）原住民族教育師資應修習原住民族文化或多元文化教育課程，以增進教學之專業能力。此外，擔任族語教學之師資，應通過族語能力認證。

（三）原住民族中、小學、原住民教育班及原住民重點學校之專任教師甄選，應優先聘 任原住民各族教師。原住民族中、小學及原住民重點學校主任、校長，應優先遴 選原住民各族群中已具主任、校長資格者擔任。

（四）各級各類學校為實施原住民族語言、文化及藝能有關之支援教學，得遴聘原住民 族耆老或具相關專長人士。

（五）中央原住民族主管機關為提升原住民族教育師資之專業能力，得辦理民族教育研習工作。

從法律層面可以了解對於原住民族族群在師資培育方面的重視與照顧，以保障原住民民族教育師資的來源，藉由制度層面的影響，或許是原住民選擇擔任教職的因素，亦為專業啟 蒙的可能性。另一方面，許多研究顯示原住民師資培育的學生具有十分高度的任教意願(林 益慶，2000、吳育哲，2001、楊淑玲，2001、蘇景進，2008）。這也表示影響原住民選擇教職工作的因素可能會來自對於族群意識的聯繫與維護，值得我們去深入探討與了解。

# 研究方法

## 一、研究架構

本研究擬探尋原住民女性科學教師其專業啟蒙的典範，透過量化的調查研究與分析，以建立原住民女性科學教師典範模式，並由量化分析結果選擇合適的原住民女性科學教師典範個案，進行質性訪談，了解原住民女性科學教師專業啟蒙的歷程與情形，以形塑原住民女性科學教師專業啟蒙典範。最後，藉由典範個案教師的生命敘寫，深層構築原住民女性科學教師專業啟蒙的典範。

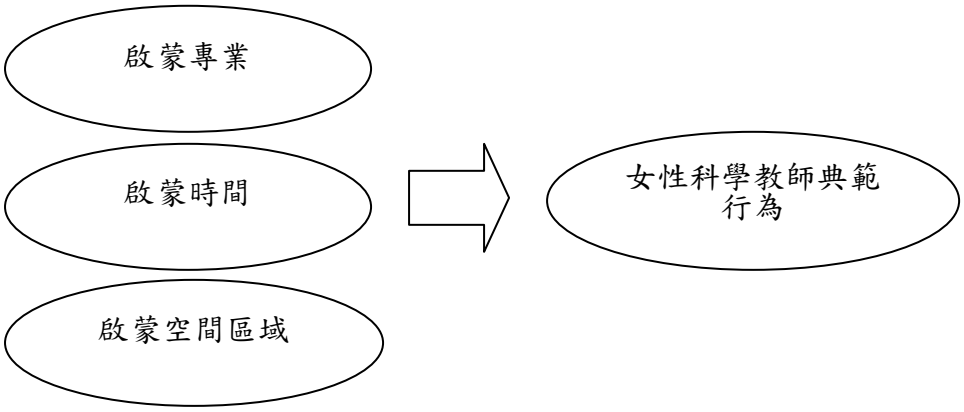



圖 1 研究架構圖

為構築原住民女性科學教師專業啟蒙典範，了解原住民女性科學教師從進入師資培育體系的選擇開始，到學習歷程的看法與想法，透過對原住民女性科學教師個人、家庭與社會因素的了解，以獲得原住民女性科學教師在專業啟蒙的典範。

## 二、研究對象

本計畫之研究對象為原住民女性科學教師，其教職服務階級從幼稚園、國小、國中到高中職四個階段。在科學教師的界定上主要分為兩類，一類為幼稚園及國小不分科教師，一類為中等學校從事關於科學類科之教學活動的女性教師。由於幼稚園及國小教學場域教師為不分科，且配合時代的脈動，教師需具備資訊專業能力，並將資訊融入教學，因此將幼稚園及國小所有原住民女性教師皆列為科學教師。另外，在中等學校方面，則可依教育部將大專校院三大分類科系－人文、社會及科技，取科技分類科系作為篩選出女性科學教師的參考。根據前項處理依據，原住民女性教師計有855人。

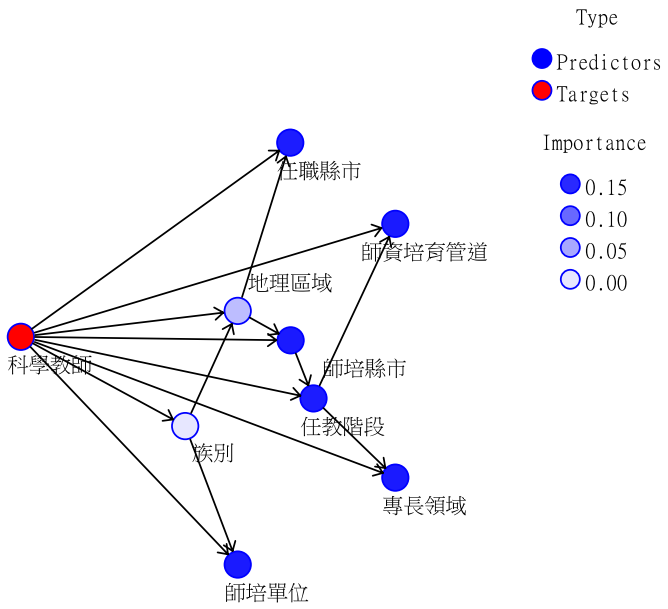
## 三、研究方法

在研究方法方面，本研究採實徵資料分析為主軸，以獲取原住民女性科學教師專業啟蒙典範全貌，以資料與文獻的蒐集做為研究的基礎，發展問卷進行調查，了解原住民女性科學教師專業啟蒙典範形成的因素、特質、現況與情形，建構典範模式。

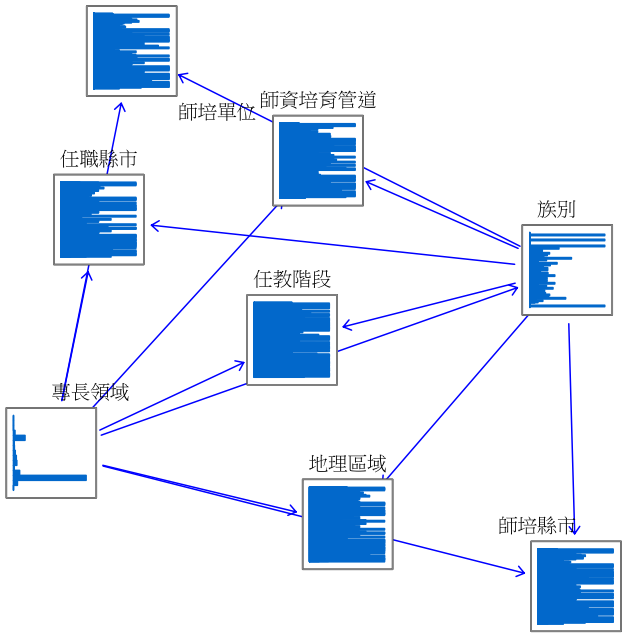
# 結論

依據實徵資料分析支持下列各項主要結果：

一、影響女性原住民教師成為科學專業的因素(重要性由高而低)：師資培育管道、師培單位、現職任教縣市、師培單位所在縣市、任教階段、地理區域、族別。其結構如下圖：




二、女性原住民科學教師專長啟蒙的結構示意如下：




本案成果業已發表研討會論文四篇，期刊論文兩篇已出版，正式出版資訊如下：

- **Study the Relationship between Age Group and Gender of Taiwanese Aboriginal Teachers in Junior High School by Using Poisson Regression model**, *Recent Researches in Communications, Information Science and Education*, p127-132,

ISBN: 978-1-61804-077-0

- **Use General Log-linear Analysis Procedure Analyzes the Frequency Counts of Taiwanese Aboriginal Primary School Teachers Falling into each Age Group and Gender Category in a Cross-tabulation Table**, *Recent Researches in Communications, Information Science and Education,* p133-138, ISBN: 978-1-61804-077-0
- **Use the General Log-linear Analysis Procedure by Fitting a Log-linear Model with Age Group and Gender as Factors for Preschool Aboriginal Teachers in Taiwan**, *Recent Researches in Communications, Information Science and Education,* p139-144, ISBN: 978-1-61804-077-0
- **A Study of Age Distribution of Aboriginal Teachers in Taiwan**, *Recent Researches in Communications, Information Science and Education,* p145-151, ISBN: 978-1-61804-077-0
- Kuo, L.H., Wei, H.-M., & Yang, H.J. (2012). Use the General Log-linear Analysis Procedure to Study Taiwanese Aboriginal Teachers in Junior High School, *INTERNATIONAL JOURNAL OF EDUCATION AND INFORMATION TECHNOLOGIES,* 6(2), pp. 201-208. (EI)
- Kuo, L.H., Yang, H.H., Yang, H.J., Ko, S.P., & Huang, H.C. (2012). Use the Poisson Regression Model to Study Primary school Aboriginal Teachers in Taiwan, *INTERNATIONAL JOURNAL OF EDUCATION AND INFORMATION TECHNOLOGIES*, 6(2), pp.209-216. (EI)

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附件二

# 國科會補助專題研究計畫成果報告自評表

請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現或其他有關價值等，作一綜合評估。

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估

☑ 達成目標

☐ 未達成目標（請說明，以 100 字為限）

☐ 實驗失敗

☐ 因故實驗中斷

☐ 其他原因

說明：

2. 研究成果在學術期刊發表或申請專利等情形：

論文：☑已發表 ☐未發表之文稿 ☐撰寫中 ☐無

專利：☐已獲得 ☐申請中 ☐無

技轉：☐已技轉 ☐洽談中 ☐無

其他：（以 100 字為限）

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）（以 500 字為限）

本案透過實證資料分析釐清女性科學教師啟蒙脈絡，並建立女性科學教師專業啟蒙模式，將近五十年的專業啟蒙結構化。初步研究成果參與研討會提出口頭宣讀與討論並收錄至正式出版之論文集中，共計四篇，期刊發表兩篇：

- **Study the Relationship between Age Group and Gender of Taiwanese Aboriginal Teachers in Junior High School by Using Poisson Regression model**, *Recent Researches in Communications, Information Science and Education,* p127-132, ISBN: 978-1-61804-077-0
- **Use General Log-linear Analysis Procedure Analyzes the Frequency Counts of Taiwanese Aboriginal Primary School Teachers Falling into each Age Group and Gender Category in a Cross-tabulation Table**, *Recent Researches in Communications, Information Science and Education,* p133-138, ISBN: 978-1-61804-077-0
- **Use the General Log-linear Analysis Procedure by Fitting a Log-linear Model with Age Group and Gender as Factors for Preschool Aboriginal Teachers in Taiwan**, *Recent Researches in Communications, Information Science and Education,* p139-144, ISBN: 978-1-61804-077-0
- **A Study of Age Distribution of Aboriginal Teachers in Taiwan**, *Recent Researches in Communications, Information Science and Education,* p145-151, ISBN: 978-1-61804-077-0

- **Kuo, L.H., Wei, H.-M., & Yang, H.J. (2012). Use the General Log-linear Analysis Procedure to Study Taiwanese Aboriginal Teachers in Junior High School, INTERNATIONAL JOURNAL OF EDUCATION AND INFORMATION TECHNOLOGIES, 6(2), pp. 201-208. (EI)**
- **Kuo, L.H., Yang, H.H., Yang, H.J., Ko, S.P., & Huang, H.C. (2012). Use the Poisson Regression Model to Study Primary school Aboriginal Teachers in Taiwan, INTERNATIONAL JOURNAL OF EDUCATION AND INFORMATION TECHNOLOGIES, 6(2), pp.209-216. (EI)**

本案提出之發現將可為原住民專業化發展之參酌，為科技專業人力資源發展研究紮根，亦為師資培育專業成長上落實基礎研究工作。

附件三

# 國科會補助計畫衍生研發成果推廣資料表

日期：___年__月__日

<table>
<tr><td>國科會補助計畫</td><td colspan="3">計畫名稱：<br>計畫主持人：<br>計畫編號：　　領域：</td></tr>
<tr><td rowspan="2">研發成果名稱</td><td colspan="3">（中文）</td></tr>
<tr><td colspan="3">（英文）</td></tr>
<tr><td>成果歸屬機構</td><td></td><td>發明人<br>（創作人）</td><td></td></tr>
<tr><td rowspan="2">技術說明</td><td colspan="3">（中文）<br><br>（200-500 字）</td></tr>
<tr><td colspan="3">（英文）</td></tr>
<tr><td>產業別</td><td colspan="3"></td></tr>
<tr><td>技術/產品應用範圍</td><td colspan="3"></td></tr>
<tr><td>技術移轉可行性及預期效益</td><td colspan="3"></td></tr>
</table>

註：**本項研發成果若尚未申請專利，請勿揭露可申請專利之主要內容。**

附件四

# 國科會補助專題研究計畫項下出席國際學術會議心得報告

日期: 101 年 6 月 6 日

| | | | |
|---|---|---|---|
| 計畫編號 | NSC100－2620－S－017－002－ | | |
| 計畫名稱 | 尋找原住民女性科學教師的典範－原住民女性科學教師專業啟蒙的探勘 | | |
| 出國人員姓名 | 楊宏仁 | 服務機構及職稱 | 國立高雄師範大學工業教育學系<br>教授 |
| 會議時間 | 101 年 5 月 11 日至 101 年 5 月 13 日 | 會議地點 | 新加坡 |
| 會議名稱 | (中文)第十二屆 WSEAS 應用電算科學國際會議 ACS'12<br>(英文)**the 12th WSEAS International Conference on Applied Computer Science (ACS'12)** | | |
| 發表論文題目 | (中文)運用雛形法設計網路線上課程<br>(英文)**Design a Web-based Course by Applying Prototyping Method** | | |

一、參加會議經過

五月十日自高雄小港出發，經由香港轉機赴新加坡，于會議當天五月十一日上午清晨到達會場進行準備，於八點半後便開始了會議行程。參與之議程如下

2012/05/11 Friday

Conference Room C:
Time: 09:45-10:30
PlenaryLecture6:
Evaluating the Quality of Teaching within an ICT-Rich Environment
by Prof. Hung-Jen Yang, National Kaohsiung Normal University, TAIWAN, R.O.C.

Conference Room A:
Time: 14:00-16:30
ACS Session: Latest Trends in Information Science
**Chair: Hung-Jen Yang**, Anon Sukstrienwong

| | | |
|---|---|---|
| **Design a Web-based Course by Applying Prototyping Method** | Jui-Chen Yu, Hsieh-Hua Yang, Wen-Chen, Hu, Lung-Hsing Kuo, Li-Min Chen, Hung-Jen Yang | 6862-098 |
| A Case Study of Software Development for Memorandum Report System: MRS | Patravadee Vongsumedh, Anon Sukstrienwong | 6862-002 |
| A Case Study of Performance Improvement of Database System based on Distributed Processing | Sorapak Pukdesree | 6862-042 |
| The Design and Development of a CPU Scheduling Algorithm Simulator | Sukanya Suranauwarat | 6862-130 |
| Improving the Effectiveness of Learning Page Replacement Algorithms using an Interactive Animated Tool | Sukanya Suranauwarat | 6862-134 |
| ANN-based Groundwater Level Forecasting Employing SOM Clustering Approach | Vahid Nourani, Farnaz Daneshvar Vousoughi, Aida Hosseini Baghanam, Mohammad Taghi Alami | 6862-066 |
| Wavelet-based Feature Extraction of Rainfall-Runoff Process via Self-Organizing Map | Vahid Nourani, Masoumeh Parhizkar, Tohid Rezapour Khanghah, Aida Hosseini Baghanam, Elnaz Sharghi | 6862-062 |

2012/05/12 Saturday

Conference Room C:
Time: 11:00-13:00
CISCO & DSIA Session: Web Applications and Cloud Computing
Chair: Choi Euiin, **Hung-Jen Yang**

| | | |
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| Identification of Performance Issues in Contemporary Black-Box Web Application Scanners in SQLI | Ha Thanh Le, Peter Kok Keong Loh | 6865-018 |
| Multimodal Interface for Mobile Cloud Computing | Hoon Jeong, Sungjin Kim, Hana Do, Euiin Choi,Yeojin Jeong, Yongho Kang | 6865-098 |
| Integrating Cloud Computing into Senior High-School Learning | Ming-Cheng Wang, Ying-Ju Chen, Lung-Hsing Kuo, Hung-Jen Yang, Hsieh-Hua Yang | 6865-054 |
| Mobile Cloud Computing: A Review on Smartphone Augmentation Approaches | Saeid Abolfazli, Zohreh Sanaei, Abdullah Gani | 6865-006 |
| Tripod of Requirements in Horizontal Heterogeneous Mobile Cloud Computing | Zohreh Sanaei, Saeid Abolfazli, Abdullah Gani, Rashid Hafeez Khokhar | 6865-022 |
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參與議程結束後便搭車到新加坡樟宜國際機場搭機，經由香港後轉機抵達小港機場，抵達時已經是十二日午夜。

二、與會心得

本次會議所發表之國科會高瞻計畫與女性科學教師啟蒙專案研究成果，均能獲得與會同儕專業的互動與討論，具體心得摘要如下各點。

1. 研究結論受到與會者肯定。

2. 研究方法與專家同好相互討論獲得具體交流經驗與未來研究方向的啟發。

3. 研究同儕的相互惕勵有助於延續研究成果與擴大影響，應可積極為國際化研究成果擴散上發會助力。

4. 研究成果於國際會議上正式宣讀發表、互動研討，並正式出版流通，可落實研究案成果國際流通之基礎建立。

三、建議

本次會議時間精實並獲得預期效益，僅就研究成果交流具體建議如下各點：

1. 持續加強研究成果面對面的討論與交流,有利研究者研究發表口與說明之實質經驗的提升，應多予以鼓勵與倡導。

2. 研討會的研究口頭宣讀壓力較期刊發表高,且須臨場應變與溝通,對於研究交流之國際互動亦有較佳的成果，建議提升在學術審查之地位與影響。

四、攜回資料名稱及內容

研討會手冊與正式出版之論文集光碟，內容如下：

研討會手冊：大會組成、演講場次摘要、論文發表議程。

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# 國科會補助專題研究計畫項下出席國際學術會議心得報告

日期: 101 年 7 月 1 日

| | | | |
|---|---|---|---|
| 計畫編號 | NSC 100-2629-S-017-002 | | |
| 計畫名稱 | **尋找原住民女性科學教師的典範--原住民女性科學教師專業啟蒙的探勘** | | |
| 出國人員<br>姓名 | 郭隆興 | 服務機構<br>及職<br>稱 | 高雄師範大學/副教授 |
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| 會議名稱 | (中文)第 11 屆世界科學與工程學院和學會國際會議—教育與教育科技<br>(英文)11th WSEAS International Conference on EDUCATION and EDUCATIONAL TECHNOLOGY (EDU '12) | | |
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一、參加會議經過

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教育與科技教育的探討。會議地點在亞洲四小龍之首：新加坡市舉辦。本會議為期三天，全世界各大洲之學術界均有論文發表，場面熱烈。

二、與會心得

WSEAS 學會成立于 1996 年，為一非牟利的組織。成立目的在於促進發展新的科學研究方法和資訊計算技術，及其在科技上的應用。特別是在數學、電腦科學與電氣工程，以及其他相互影響到的科學領域（物理、化學、生物學、醫學、工程、地球科學、空間科學……等）。此外，該學會亦補助研究專案、授予獎學金及獎項、舉辦國際會議、研討會、出版期刊和書籍和進行自主科學/工程研究或與大學和國家或私人的研究中心和機構合作，是目前全球最重要的國際型學術組織與會議之一。

三、考察參觀活動(無是項活動者略)　無

四、建議

目前台灣面對國際化變局，已悄然出現人才斷層的隱憂，建議國科會要排除萬難，台灣學術界只要有國際參與的機會，應即優予補助。為了要與世界密切接軌，就要隨時與外界第一手接觸，才能收到他山之石，可以攻錯的功效。

五、攜回資料名稱及內容

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台灣學術界宜多多參與國際合作與學術外交，接軌國際調查研究，才能提昇國際研究調查的文化公平性，增加台灣在國際上的能見度。

# 國科會補助專題研究計畫項下出席國際學術會議心得報告

日期: 101 年 6 月 6 日

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三、考察參觀活動(無是項活動者略)　無

四、建議

目前台灣面對國際化變局，已悄然出現人才斷層的隱憂，建議國科會要排除萬難，台灣學術界只要有國際參與的機會，應即優予補助。為了要與世界密切接軌，就要隨時與外界第一手接觸，才能收到他山之石，可以攻錯的功效。

五、攜回資料名稱及內容

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**WORLD SCIENTIFIC and ENGINEERING ACADEMY and SOCIETY**
**http://www.wseas.org**



March 20th, 2012

Dear Dr. Lung-Hsing Kuo

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Paper ID number: 6863-029
Title: Identify Contents of Evaluating the Curriculum Development of Integrating Emerging Technology
Authors: LUNG-HSING KUO, HUNG-JEN YANG, LI-MING CHEN, MING-CHEN WANG, YING-JU CHEN

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# Study the Relationship between Age Group and Gender of Taiwanese Aboriginal Teachers in Junior High School by Using Poisson Regression model

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Abstract: -
The education outcomes of Taiwanese aboriginal people are the most important indicator of society improvement in Taiwan because of our environments are driven by changes in society, fast growth by science, technology and knowledge development in recent years. Aboriginal people have special culture and historical background so we need aboriginal teachers to give aboriginal students a better quality of education and improving their learning. This study aims to find aboriginal teacher education gaps and the relationship between age group and gender of Taiwanese aboriginal teacher in junior high school. We found there is a real relationship between age group and sex. The result shows we have strong evidence that the female Taiwanese aboriginal teachers are more than male Taiwanese aboriginal teachers in junior high school with age group of 22-29 to 35-39. We suggest there is a need to make a long term planning on junior high school aboriginal teacher education sufficient to support junior high school aboriginal education.

*Key-Words:* teacher education, Taiwanese aboriginal teacher, junior high school education

## 1 Introduction

Since moving to Taiwan, the central government's educational policy for Aboriginals has gone through four stages, “the equal treatment stage”, “the fusion stage”, “the open development stage”, and “identity development stage”. The last stage is from 2001 to present day. In 2000, the Taiwan Provincial Government was trimmed and downgraded. The affairs handled by its education department were placed under MOE jurisdiction. The program to reinforce aboriginal student education of the educational reform movement project continued to be promoted. In 2003, the National Education Development Conference was announced with "respecting aboriginal identity, developing aboriginal tribal education" as the objective. In September 2004, the Aboriginal Education Act was revised and announced, mandating the development of aboriginal education [1].

According to Council of Indigenous Peoples, Executive Yuan, in 2009, the Taiwanese aboriginal education statistics shows 85.88% of Taiwanese aboriginal their highest educational recodes are high school and vocational school or below, which means there are only 14.12% Taiwanese aboriginal their highest educational records are above high school and vocational school. It is 21.28% less than non-aboriginal [2].

From the development of education historical context, the recipients of the educational experience vary by different race and class. Therefore the existing race and class issues of education become the focus for educators [3]. In Western country, the major education system is increasingly being seen as important issue on the topics of education and race [2].

The education outcomes of Taiwanese aboriginal people are the most important indicator of society improvement in Taiwan because of our environments are driven by changes in society, fast growth by science, technology and knowledge development in recent years.

Teachers are professionals and should meet the needs of students and when teachers have more professional knowledge and passion, they can be able to offer more study opportunities for them [5]. Aboriginal people have special culture and historical background so we need aboriginal teachers to give aboriginal students a better quality of education and improving their learning. Therefore, to improve learning for aboriginal students need aboriginal teachers to teach them.

To comply with the developments of democratization, our nation expected through a free market mechanism to form more excellence teachers. Thus, “Teacher Education Act” and “Teacher Act” passed in 1994 and 1995. From then on, there has been a major teacher education reform in this country: teacher education institutions were expanded beyond Teacher’s Colleges/Normal

Universities to incorporate Universities with Teacher Education Centers; the plan of trainee teacher's controlled supply and demand has also shifted from a traditional, formerly government allowance with zero tuition fee and teaching job assignment, unified and planned system to an open sufficient reserve system. Teacher education has changed from the closed-door policy to a mechanism for free competition [6].

The retirement of public primary school teachers is divided into voluntary retirement and compulsory retirement. According to Article 4 to 6 under the Civil Service Retirement Act; the conditions for voluntary retirement are the teacher teaching more than 5 years and over 60 years of age, or 25 years of service. The conditions for compulsory retirement are teachers with more than 5 years of service and over 65 years old, or over 5 years of service and not competent for teaching due to mental or physical disadvantages. Therefore, the expected retirement ages are 50 to 54 [7].

Until 2009, there are 500 reserved aboriginal teachers but it only 17.47% of the total number of aboriginal teachers in that year. However, a big decreasing on the number of aboriginal teacher students who can get the government allowance with zero tuition fee in recent 5 years that can be results in aboriginal teacher education gaps [2].

This study aims to find the aboriginal teacher education gaps and relationship between age group and gender of Taiwanese aboriginal teacher in junior high school. The rest of the article is structured as follows. First, the brief research goals and definition of terms are given in this section. Second, the methods, data sources, models, and instrument are explained, followed by the results and findings. The last section concludes with a summary in this study.

### Definition of Terms

- **Sex:** "female" or "male"
- **Age group:** either 22-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55 above.

## 2 Study Design

### 2.1 Research Subjects

In this study the subjects are the Taiwanese aboriginal teachers in junior high school in 2009. We use 2009 Nationwide Teacher in-service Advancement Education Information Web (http://inservice.edu.tw/) database to get the subjects and Yearbook of Teacher Education Statistics (supplementary report) [8] as a reference. The basic data analyses are shown in Table 1 and Figure 1.

Table 1 frequency table by gender

| Sex | Frequency | Percent (%) |
|---|---|---|
| Female | 186 | 49.2 |
| Male | 192 | 50.8 |
| Total | 378 | 100.0 |

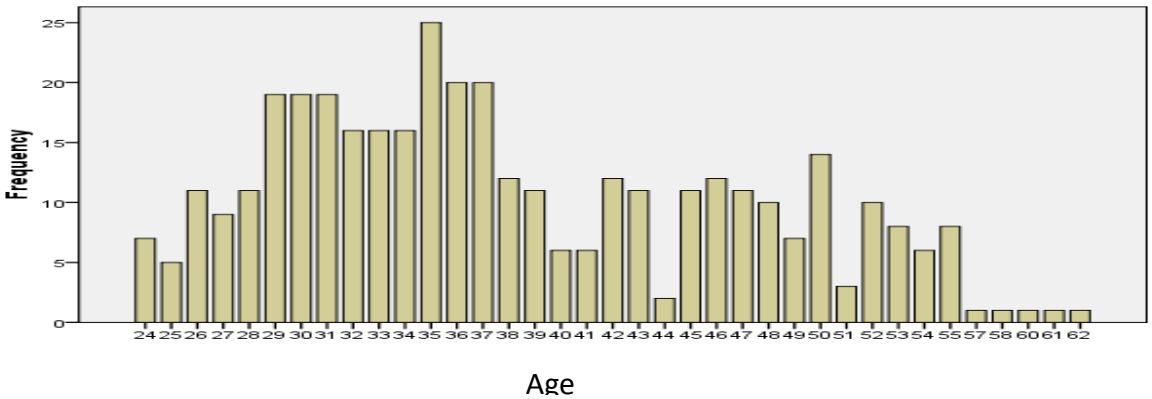


Figure 1. Age distribution

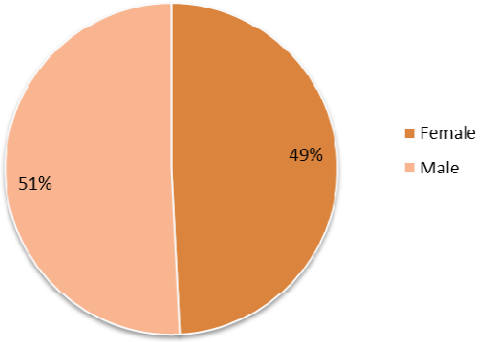


Figure 2. Pie Chart of No. of aboriginal junior high school techers by gender

### 2.2 Instrument, Data Analysis & Assumption

The SPSS statistical software is used in this study. We use Chi-square test to test for the significance of relationships between variables cross-classified in a bivariate table. In our case, the variables are the age group and sex. The null hypothesis in this study is there is no relationship between age group and sex. Then, we use Poisson regression to predict number of junior high school Taiwanese aboriginal teachers among age and sex groups.

In this study we assumes the number of Taiwanese aboriginal teachers in junior school has a Poisson distribution, and assumes the logarithm of its age group and sex can be modeled by a linear combination of unknown parameters.

## 3. Findings

Figure 2 and Table 2 shows the number of Taiwanese aboriginal teachers in junior high school aged from 22 -29, 30 -34, 35-39, 40-44, 45-49, 50-54, and 55 above is 16.4%, 22.8%, 23.3%, 9.8%, 13.5%, 10.8%, and 3.4% of total Taiwanese aboriginal teacher in junior high school. Overall, the highest percentage of Taiwanese aboriginal teachers in junior high school falls in the age group of 35 to 39 and teachers of 55 years old or above represent only 3.4% which is the lowest.

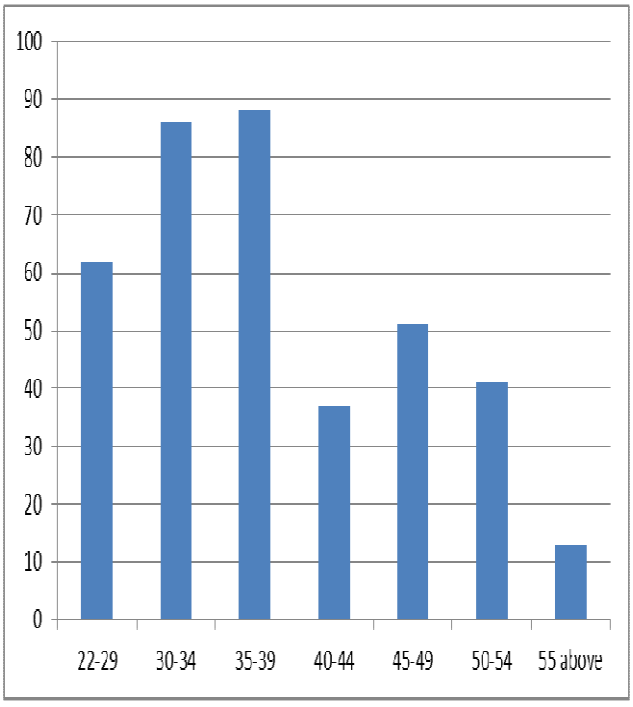


Figure 2. Bar graph of age group

Table 3 is the cross table for age group and sex. It shows the expected count and observation value is about the same for Taiwanese aboriginal teachers in junior school between their age group and sex group. Table 4 shows the chiq-square test for testing the relationship between age group and sex. We found there is a real relationship between age group and sex for Taiwanese aboriginal teachers in junior high school so we should add their interaction as a model effect. The parameter for this effect quantifies that relationship.

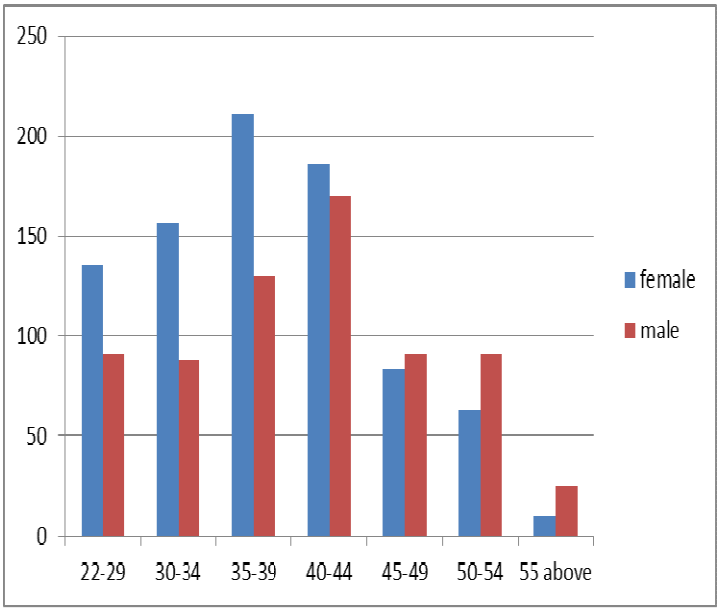


Figure 3. bar graph of age group and sex

Table 2. Frequency table of age group

| Age group | Frequency | Percent (%) |
|---|---|---|
| 22-29 | 62 | 16.4 |
| 30-34 | 86 | 22.8 |
| 35-39 | 88 | 23.3 |
| 40-44 | 37 | 9.8 |
| 45-49 | 51 | 13.5 |
| 50-54 | 41 | 10.8 |
| 55 above | 13 | 3.4 |
| Total | 378 | 100.0 |

From the Table 5, it shows we have strong evidence that the ratio of the odds a 22-29 years old female aboriginal teachers in junior high school to the odds male is exp(2.849)=17.27; the ratio of the odds a 30-34 years old female aboriginal teachers in junior high school to the odds male is exp(2.398)=11.00; the ratio of the odds a 35-39 years old female aboriginal teachers in junior high

ISBN: 978-1-61804-077-0

to the odds male is exp(2.392)=10.94.

able 3 Cross table for age group and sex

| | | sex | | |
|---|---|---|---|---|
| | | Female | Male | Total |
| 22-29 | Count | 42 | 20 | 62 |
| | Expected Count | 30.5 | 31.5 | 62.0 |
| | % of Total | 11.1% | 5.3% | 16.4% |
| 30-34 | Count | 49 | 37 | 86 |
| | Expected Count | 42.3 | 43.7 | 86.0 |
| | % of Total | 13.0% | 9.8% | 22.8% |
| 35-39 | Count | 50 | 38 | 88 |
| | Expected Count | 43.3 | 44.7 | 88.0 |
| | % of Total | 13.2% | 10.1% | 23.3% |
| 40-44 | Count | 15 | 22 | 37 |
| | Expected Count | 18.2 | 18.8 | 37.0 |
| | % of Total | 4.0% | 5.8% | 9.8% |
| 45-49 | Count | 19 | 32 | 51 |
| | Expected Count | 25.1 | 25.9 | 51.0 |
| | % of Total | 5.0% | 8.5% | 13.5% |
| 50-54 | Count | 10 | 31 | 41 |
| | Expected Count | 20.2 | 20.8 | 41.0 |
| | % of Total | 2.6% | 8.2% | 10.8% |
| 55 above | Count | 1 | 12 | 13 |
| | Expected Count | 6.4 | 6.6 | 13.0 |
| | % of Total | .3% | 3.2% | 3.4% |
| Total | Count | 186 | 192 | 378 |
| | Expected Count | 186.0 | 192.0 | 378.0 |
| | % of Total | 49.2% | 50.8% | 100.0% |

Table 4 Chi-square test for age group and sex

| | Value | df | Asymp. Sig. (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 35.733[a] | 6 | .000 |
| Likelihood Ratio | 38.143 | 6 | .000 |
| Linear-by-Linear Association | 33.542 | 1 | .000 |
| N of Valid Cases | 378 | | |

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.40.

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Table 5 parameter estimates

| Parameter | Estimate | Std. Error | Z | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Constant | 2.526 | .283 | 8.930 | .000 | 1.971 | 3.080 |
| 22-29 | .495 | .359 | 1.379 | .168 | -.209 | 1.198 |
| 30-34 | 1.099 | .327 | 3.364 | .001 | .458 | 1.739 |
| 35-39 | 1.125 | .326 | 3.456 | .001 | .487 | 1.763 |
| 40-44 | .588 | .353 | 1.666 | .096 | -.104 | 1.279 |
| 45-49 | .956 | .333 | 2.871 | .004 | .303 | 1.608 |
| 50-54 | .924 | .334 | 2.765 | .006 | .269 | 1.579 |
| 55 above | 0[a] | . | . | . | . | . |
| Female | -2.120 | .864 | -2.454 | .014 | -3.814 | -.427 |
| Male | 0[a] | . | . | . | . | . |
| [22-29] * [Female] | 2.849 | .905 | 3.149 | .002 | 1.076 | 4.623 |
| [22-29] * [Male] | 0[a] | . | . | . | . | . |
| [30-34] * [Female] | 2.398 | .891 | 2.692 | .007 | .652 | 4.144 |
| [30-34] * Male] | 0[a] | . | . | . | . | . |
| [35-39] * [Female] | 2.392 | .890 | 2.687 | .007 | .647 | 4.136 |
| [35-39] * [Male] | 0[a] | . | . | . | . | . |
| [40-44] * [Female] | 1.748 | .925 | 1.889 | .059 | -.065 | 3.561 |
| [40-44] * [Male] | 0[a] | . | . | . | . | . |
| [45-49] * [Female] | 1.609 | .910 | 1.768 | .077 | -.175 | 3.394 |
| [45-49] * [Male] | 0[a] | . | . | . | . | . |
| [50-54] * [Female] | 1.022 | .935 | 1.093 | .274 | -.810 | 2.854 |
| [50-54] * Male] | 0[a] | . | . | . | . | . |
| [55 above] * [Female] | 0[a] | . | . | . | . | . |
| 55 above ] * [Male] | 0[a] | . | . | . | . | . |

a. This parameter is set to zero because it is redundant.

b. Model: Poisson

c. Design: Constant + 年齡分層 + sex + 年齡分層 * sex

# 4 Summary

This study aims to find the relationship between age group and gender of Taiwanese aboriginal teacher in junior high school. The conclusions are as follows:

- We found female Taiwanese aboriginal teachers are only 1.6% more than male who teaching in junior high school.
- The highest percentage of junior high school Taiwanese aboriginal teachers falls in the age group of 35 to 39 and teachers of 55 years old or above represent only 3.4% which is the lowest.
- In 2009, the average age of Taiwanese aboriginal teachers in junior high school is 38 and age group of 22-29 to 35-39 has 60 above aboriginal teachers. Although we cannot immediately see the teacher retirement rate existing teacher supply which results in aboriginal teacher education gaps but to concern aboriginal students their learning equity and avoid teacher education gaps in the future, we suggest there is a need to make a long term planning on junior high school aboriginal teacher education sufficient to support l aboriginal education in junior high school.
- There is a real relationship between age group and sex for Taiwanese aboriginal teachers in junior high school.
- We have strong evidence that the female Taiwanese aboriginal teachers are more than male

Taiwanese aboriginal teachers in junior high school with age group 22-29 to 35-39.

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# Use General Log-linear Analysis Procedure Analyzes the Frequency Counts of Taiwanese Aboriginal Primary School Teachers Falling into each Age Group and Gender Category in a Cross-tabulation Table

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Abstract: -

Teachers are professionals and should meet the needs and give aboriginal students a better quality of education because aboriginal people have special culture and historical background. We need aboriginal teachers to improve aboriginal students their learning. This study aims to find aboriginal teacher education gaps and the relationship between age group and gender of Taiwanese aboriginal teacher in primary school We found there is a real relationship between age group and sex. The result shows we have strong evidence that the female Taiwanese aboriginal teachers are more than male Taiwanese aboriginal teachers in primary school with age group 22-29 to 45-49. We suggest there is a need to make a long term planning on primary school aboriginal teacher education sufficient to support primary school aboriginal education.

*Key-Words:* General Log-linear Analysis**,** teacher education, Taiwanese aboriginal teacher

## 1 Introduction

The education outcomes of Taiwanese aboriginal people are the most important indicator of society improvement in Taiwan because of our environments are driven by changes in society, fast growth by science, technology and knowledge development in recent years.

Since moving to Taiwan, the central government's educational policy for Aboriginals has gone through four stages, “the equal treatment stage”, “the fusion stage”, “the open development stage”, and “identity development stage”. The last stage is from 2001 to present day. In 2000, the Taiwan Provincial Government was trimmed and downgraded. The affairs handled by its education department were placed under MOE jurisdiction. The program to reinforce aboriginal student education of the educational reform movement project continued to be promoted. In 2003, the National Education Development Conference was announced with "respecting aboriginal identity, developing aboriginal tribal education" as the objective. In September 2004, the Aboriginal Education Act was revised and announced, mandating the development of aboriginal education [3].

According to Council of Indigenous Peoples, Executive Yuan, in 2009, the Taiwanese aboriginal education statistics shows 85.88% of Taiwanese aboriginal their highest educational recodes are high school and vocational school or below, which means there are only 14.12% Taiwanese aboriginal their highest educational records are above high school and vocational school. It is 21.28% less than non-aboriginal [4].

From the development of education historical context, the recipients of the educational experience vary by different race and class. Therefore the existing race and class issues of education become the focus for educators [1]. In Western country, the major education system is increasingly being seen as important issue on the topics of education and race [2].

Aboriginal people have special culture and historical background. Teachers are professionals and should meet the needs and give aboriginal students a better quality of education. When teachers have more professional knowledge and passion, they can be able to offer more study opportunities for students [5]. Therefore, to improve learning for aboriginal students need aboriginal teachers to teach them.

### 1.1 Teacher Education Reform

To comply with the developments of democratization, our nation expected through a free market mechanism to form more excellence teachers. Thus, "Teacher Education Act" and "Teacher Act" passed in 1994 and 1995. From then on, there has been a major teacher education reform in this country: teacher education institutions were expanded beyond Teacher's Colleges/Normal Universities to incorporate Universities with Teacher Education Centers; the plan of trainee teacher's controlled supply and demand has also shifted from a traditional, formerly government allowance with zero tuition fee and teaching job assignment, unified and planned system to an open sufficient reserve system. Teacher education has changed from the closed-door policy to a mechanism for free competition [6].

### 1.2 Teacher Retirement

The retirement of public primary school teachers is divided into voluntary retirement and compulsory retirement. According to Article 4 to 6 under the Civil Service Retirement Act; the conditions for voluntary retirement are the teacher teaching more than 5 years and over 60 years of age, or 25 years of service. The conditions for compulsory retirement are teachers with more than 5 years of service and over 65 years old, or over 5 years of service and not competent for teaching due to mental or physical disadvantages. Therefore, the expected retirement ages are 50 to 54 [7].

Until 2009, there are 500 reserved aboriginal teachers but it only 17.47% of the total number of aboriginal teachers in that year. However, a big decreasing on the number of aboriginal teacher students who can get the government allowance with zero tuition fee in recent 5 years that can be results in aboriginal teacher education gaps [4].

This study aims to find the aboriginal teacher education gaps and relationship between age group and gender of Taiwanese aboriginal teacher in primary school. The rest of the article is structured as follows. First, the brief research goals and definition of terms are given in this section. Second, the methods, data sources, models, and instrument are explained, followed by the results and findings. The last section concludes with a summary in this study.

### 1.3 Aim of the Study

The research goals in this study are:

- Does aboriginal teacher education gaps exist in primary school ?
- Is there any relationship between sex and age group of Taiwanese aboriginal teachers in primary school?
- Does sex affect number of Taiwanese aboriginal teachers in primary school?
- Which sex effect number of Taiwanese aboriginal teachers in primary school?
- Does age group affect number of Taiwanese
- aboriginal teachers in primary school?
- Which age group effect number of teachers in primary school?

### 1.4 Definition of Terms

- **Sex:** "female" or "male"
- **Age group:** either 22-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55 above.

Table 1 frequency table by gender

| Sex | Frequency | Percent (%) |
|---|---|---|
| Female | 845 | 55.2 |
| Male | 686 | 44.8 |
| Total | 1531 | 100.0 |

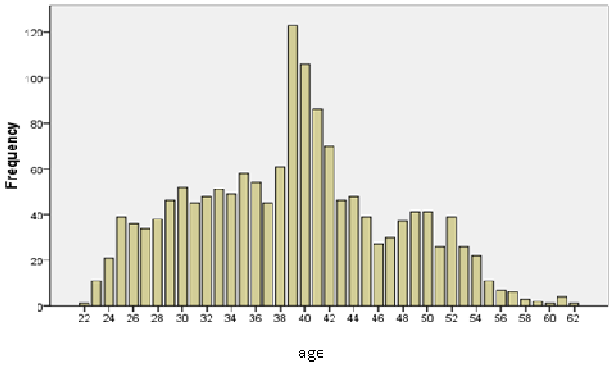


Figure 1. Age distribution

# 2 Study Design

## 2.1 Research Subjects

In this study the subjects are the Taiwanese aboriginal teachers in primary school in 2009. We use 2009 Nationwide Teacher in-service Advancement Education Information Web (http://inservice.edu.tw/) database to get the subjects and Yearbook of Teacher Education Statistics (supplementary report) [8] as a reference. The basic data analyses are shown in Table 1 and Figure 1.

## 2.2 Instrument, Data Analysis & Assumption

The SPSS statistical software is used in this study. We use Chi-square test to test for the significance of relationships between variables cross-classified in a bivariate table. In our case, the variables are the age group and sex. The null hypothesis in this study is there is no relationship between age group and sex. Then, we use general log-linear analysis procedure analyzes with Poisson distribution to predict the odds ratio of the number of primary school Taiwanese aboriginal teachers among age and sex groups. We assumes the number of Taiwanese aboriginal teachers in primary school has a Poisson distribution, and assumes the logarithm of its age group and sex can be modeled by a linear combination of unknown parameters.

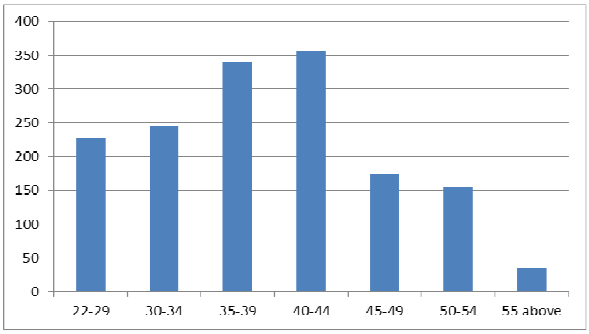


Figure 2. Bar graph of age group

Table 2. Frequency table of age group

| Age group | Frequency | Percent (%) |
|---|---|---|
| 22-29 | 226 | 14.8 |
| 30-34 | 245 | 16.0 |
| 35-39 | 341 | 22.3 |
| 40-44 | 356 | 23.3 |
| 45-49 | 174 | 11.4 |
| 50-54 | 154 | 10.1 |
| 55 above | 35 | 2.3 |
| Total | 1531 | 100.0 |

# 3. Results

Figure 2 and Table 2 shows the number of Taiwanese aboriginal teachers in primary school aged from 22 to 29, 30 to 34, 35-39, 40-44, 45-49, 50-54, and 55 above is 14.8%, 16.0%, 22.3%, 23.3%, 11.4%, 10.1%, and 2.3% of total Taiwanese aboriginal teacher in primary school. Overall, the highest percentage of Taiwanese aboriginal teachers in primary school falls in the age group of 40 to 44 and teachers of 55 years old or above represent only 2.3% which is the lowest.

Table 3 is the cross table for age group and sex. It shows the expected count and observation value is about the same for Taiwanese aboriginal teachers in primary school between their age group and sex group. Table 4 shows the chiq-square test for testing the relationship between age group and sex. We found there is a real relationship between age group and sex for Taiwanese aboriginal teachers in primary school so we should add their interaction as a model effect. The parameter for this effect quantifies that relationship.

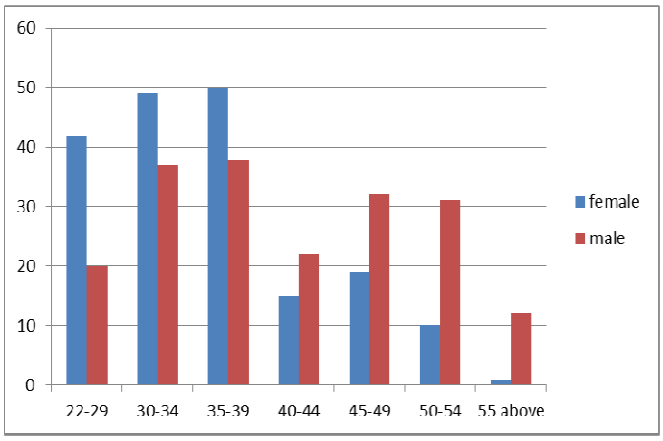


Figure 3. bar graph of age group and sex

From the Table 5, it shows we have strong evidence that the ratio of the odds a 22-29 years old female aboriginal teachers in primary school to the odds male is exp(1.280)=3.60; the ratio of the odds a 30-34 years old female aboriginal teachers in primary school to the odds male is exp(1.464)= 4.32; the ratio of the odds a 35-39 years old female aboriginal teachers in primary school to the odds male is exp(1.370)=3.94; the ratio of the odds a 40-44 years old female aboriginal teachers in primary to the odds male is exp(0.977)=2.66; the ratio of the odds a 45-49 years old female aboriginal teachers in primary to the odds male is exp(0.796)=2.22.

ISBN: 978-1-61804-077-0

Table 3 Cross table for age group and sex

| | | sex | | |
|---|---|---|---|---|
| | | Female | Male | Total |
| 22-29 | Count | 135 | 91 | 226 |
| | Expected Count | 124.7 | 101.3 | 226.0 |
| | % of Total | 8.8% | 5.9% | 14.8% |
| 30-34 | Count | 157 | 88 | 245 |
| | Expected Count | 135.2 | 109.8 | 245.0 |
| | % of Total | 10.3% | 5.7% | 16.0% |
| 35-39 | Count | 211 | 130 | 341 |
| | Expected Count | 188.2 | 152.8 | 341.0 |
| | % of Total | 13.8% | 8.5% | 22.3% |
| 40-44 | Count | 186 | 170 | 356 |
| | Expected Count | 196.5 | 159.5 | 356.0 |
| | % of Total | 12.1% | 11.1% | 23.3% |
| 45-49 | Count | 83 | 91 | 174 |
| | Expected Count | 96.0 | 78.0 | 174.0 |
| | % of Total | 5.4% | 5.9% | 11.4% |
| 50-54 | Count | 63 | 91 | 154 |
| | Expected Count | 85.0 | 69.0 | 154.0 |
| | % of Total | 4.1% | 5.9% | 10.1% |
| 55 above | Count | 10 | 25 | 35 |
| | Expected Count | 19.3 | 15.7 | 35.0 |
| | % of Total | .7% | 1.6% | 2.3% |
| Total | Count | 845 | 686 | 1531 |
| | Expected Count | 845.0 | 686.0 | 1531.0 |
| | % of Total | 55.2% | 44.8% | 100.0% |

Table 4 Chi-square test for age group and sex

| | Value | df | Asymp. Sig. (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 43.806[a] | 6 | .000 |
| Likelihood Ratio | 44.051 | 6 | .000 |
| Linear-by-Linear Association | 34.326 | 1 | .000 |
| N of Valid Cases | 1531 | | |

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 15.68.

ISBN: 978-1-61804-077-0

Table 5 parameter estimates

| Parameter | Estimate | Std. Error | Z | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Constant | 3.239 | .198 | 16.355 | .000 | 2.851 | 3.627 |
| 22-29 | 1.278 | .224 | 5.706 | .000 | .839 | 1.717 |
| 30-34 | 1.244 | .225 | 5.536 | .000 | .804 | 1.685 |
| 35-39 | 1.633 | .217 | 7.541 | .000 | 1.208 | 2.057 |
| 40-44 | 1.900 | .212 | 8.949 | .000 | 1.484 | 2.316 |
| 45-49 | 1.278 | .224 | 5.706 | .000 | .839 | 1.717 |
| 50-54 | 1.278 | .224 | 5.706 | .000 | .839 | 1.717 |
| 55 above | 0[a] | . | . | . | . | . |
| Female | -.887 | .367 | -2.420 | .016 | -1.606 | -.169 |
| Male | 0[a] | . | . | . | . | . |
| [22-29] * [Female] | 1.280 | .391 | 3.275 | .001 | .514 | 2.046 |
| [22-29] * [Male] | 0[a] | . | . | . | . | . |
| [30-34] * [Female] | 1.464 | .390 | 3.753 | .000 | .699 | 2.228 |
| [30-34] * Male] | 0[a] | . | . | . | . | . |
| [35-39] * [Female] | 1.370 | .383 | 3.576 | .000 | .619 | 2.121 |
| [35-39] * [Male] | 0[a] | . | . | . | . | . |
| [40-44] * [Female] | .977 | .382 | 2.560 | .010 | .229 | 1.725 |
| [40-44] * [Male] | 0[a] | . | . | . | . | . |
| [45-49] * [Female] | .796 | .397 | 2.006 | .045 | .018 | 1.573 |
| [45-49] * [Male] | 0[a] | . | . | . | . | . |
| [50-54] * [Female] | .522 | .401 | 1.300 | .193 | -.265 | 1.309 |
| [50-54] * Male] | 0[a] | . | . | . | . | . |
| [55 above] * [Female] | 0[a] | . | . | . | . | . |
| 55 above ] * [Male] | 0[a] | . | . | . | . | . |

a. This parameter is set to zero because it is redundant.

b. Model: Poisson

c. Design: Constant + age group+ sex + age group* sex

## 4 Conclusions

This study aims to find the relationship between age group and gender of Taiwanese aboriginal teacher in primary school The conclusions are as follows:

- We found female Taiwanese aboriginal teachers are more than male who teaching in primary school, which is 55.2% of total primary school Taiwanese aboriginal teachers.
- The highest percentage of primary school Taiwanese aboriginal teachers falls in the age group of 35 to 39 and teachers of 55 years old or above represent only 2.3% which is the lowest.
- In 2009, the average age of Taiwanese aboriginal teachers in primary school is 39 and each age group all have 150 above aboriginal teachers. Although we cannot immediately see the teacher retirement rate existing teacher supply which results in aboriginal teacher education gaps but to concern aboriginal students their learning equity and avoid teacher education gaps in the future, we suggest there is a need to make a long term planning on primary school aboriginal teacher education sufficient to support l aboriginal education in primary school.
- There is a real relationship between age group and sex for Taiwanese aboriginal teachers in primary school.
- We have strong evidence that the female Taiwanese aboriginal teachers are more than male Taiwanese aboriginal teachers in primary school with age group 22-29 to 45-49.

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# Use the General Log-linear Analysis Procedure by Fitting a Log-linear Model with Age Group and Gender as Factors for Preschool Aboriginal Teachers in Taiwan

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Abstract: -
Aboriginal people have special culture and historical background. Teachers are professionals and should meet the needs and give aboriginal students a better quality of education. When teachers have more professional knowledge and passion, they can be able to offer more study opportunities for students. Therefore, to improve learning for aboriginal students need aboriginal teachers to teach them. A big decreasing on the number of aboriginal teacher students who can get the government allowance with zero tuition fee in recent 5 years that can be results in aboriginal teacher education gaps. This study aims to find the aboriginal teacher education gaps and association with the number of preschool Taiwanese aboriginal teacher among age group and gender. We found there is no real relationship between age group and sex. We suggest there is a need to make a long term planning on preschool aboriginal teacher education sufficient to support preschool aboriginal education.

*Key-Words:* Log-linear Model, teacher education, Taiwanese aboriginal teacher, preschool education

## 1 Introduction

From the development of education historical context, the recipients of the educational experience vary by different race and class. Therefore the existing race and class issues of education become the focus for educators [1]. In Western country, the major education system is increasingly being seen as important issue on the topics of education and race [2].

The education outcomes of Taiwanese aboriginal people are the most important indicator of society improvement in Taiwan because of our environments are driven by changes in society, fast growth by science, technology and knowledge development in recent years.

Since moving to Taiwan, the central government's educational policy for Aboriginals has gone through four stages, “the equal treatment stage”, “the fusion stage”, “the open development stage”, and “identity development stage”. The last stage is from 2001 to present day. In 2000, the Taiwan Provincial Government was trimmed and downgraded. The affairs handled by its education department were placed under MOE jurisdiction. The program to reinforce aboriginal student education of the educational reform movement project continued to be promoted. In 2003, the National Education Development Conference was announced with "respecting aboriginal identity, developing aboriginal tribal education" as the objective. In September 2004, the Aboriginal Education Act was revised and announced, mandating the development of aboriginal education [3].

ISBN: 978-1-61804-077-0

According to Council of Indigenous Peoples, Executive Yuan, in 2009, the Taiwanese aboriginal education statistics shows 85.88% of Taiwanese aboriginal their highest educational recodes are high school and vocational school or below, which means there are only 14.12% Taiwanese aboriginal their highest educational records are above high school and vocational school. It is 21.28% less than non-aboriginal [4].

### 1.1 Preschool education

The statistics shows in 2009 school year, the preschool enrollment rate of Taiwanese aboriginal children is reach to 93.85% (Table 1) [4].

Table 1. Preschool enrollment rate of Taiwanese aboriginal children in 2009 school year

| age | Total no. of aboriginal children | No. of children Enroll to preschool | Enrollment rate (%) |
|---|---|---|---|
| 5-6 | 7,768 | 7,290 | 93.85 |

Aboriginal people have special culture and historical background. Teachers are professionals and should meet the needs and give aboriginal students a better quality of education. When teachers have more professional knowledge and passion, they can be able to offer more study opportunities for students [5]. Therefore, to improve learning for aboriginal students need aboriginal teachers to teach them.

To comply with the developments of democratization, our nation expected through a free market mechanism to form more excellence teachers. Thus, "Teacher Education Act" and "Teacher Act" passed in 1994 and 1995. From then on, there has been a major teacher education reform in this country: teacher education institutions were expanded beyond Teacher's Colleges/Normal Universities to incorporate Universities with Teacher Education Centers; the plan of trainee teacher's controlled supply and demand has also shifted from a traditional, formerly government allowance with zero tuition fee and teaching job assignment, unified and planned system to an open sufficient reserve system. Teacher education has changed from the closed-door policy to a mechanism for free competition [6].

Until 2009, there are 500 reserved aboriginal teachers but it only 17.47% of the total number of aboriginal teachers in that year. However, a big decreasing on the number of aboriginal teacher students who can get the government allowance with zero tuition fee in recent 5 years that can be results in aboriginal teacher education gaps [4]. Therefore this study aims to find the association with the number of preschool Taiwanese aboriginal teacher among age group and gender. The rest of the article is structured as follows. First, the brief research goals and definition of terms are given in this section. Second, the methods, data sources, models, and instrument are explained, followed by the results and findings. The last section concludes with a summary in this study.

### 1.2 Aim of the Study

The research goals in this study are:

- Is there any relationship between sex and age group of preschool Taiwanese aboriginal teachers?
- Does sex affect number of preschool Taiwanese aboriginal teachers?
- Which sex effect number of preschool Taiwanese aboriginal teachers?
- Does age group affect number of preschool Taiwanese aboriginal teachers?
- Which age group effect number of preschool teachers?

ISBN: 978-1-61804-077-0

### 1.3 Definition of Terms

- **Sex:** "female" or "male"
- **Age group:** either 22-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55 above.

## 2 Study Design

### 2.1 Research Subjects

In this study the subjects are the preschool Taiwanese aboriginal teachers in 2009. We use 2009 Nationwide Teacher in-service Advancement Education Information Web (http://inservice.edu.tw/) database to get the subjects and Yearbook of Teacher Education Statistics (supplementary report) [7] as a reference. The basic data analyses are shown in Table 2 and Figure 1.

Table 2 frequency table by gender

| Sex | Frequency | Percent (%) |
|---|---|---|
| Female | 64 | 98.5 |
| Male | 1 | 1.5 |
| Total | 65 | 100.0 |

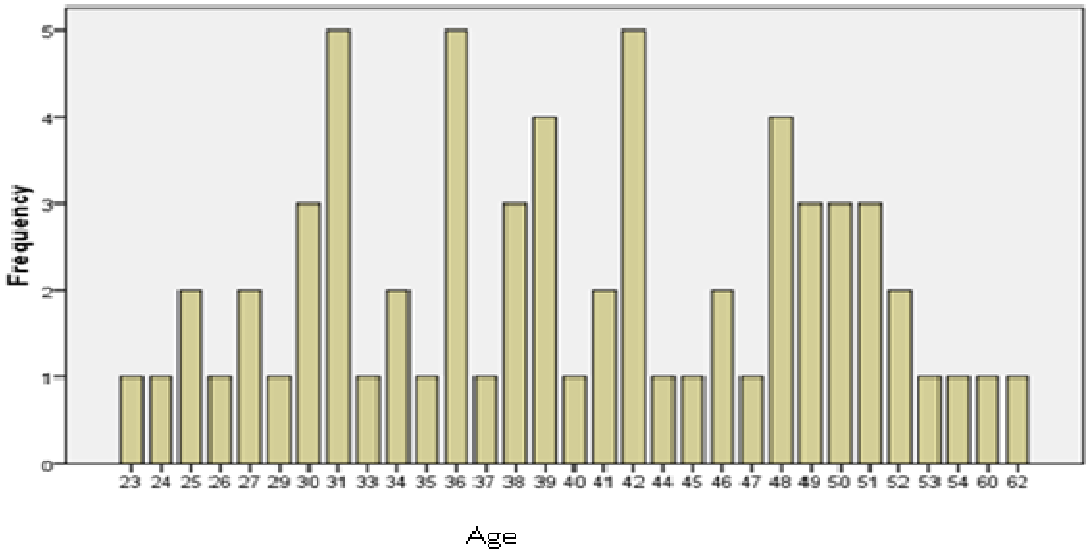


Figure 1. Age distribution

### 2.2 Instrument, Data Analysis & Assumption

The SPSS statistical software is used in this study. We use Chi-square test to test for the significance of relationships between variables cross-classified in a bivariate table. In our case, the variables are the age group and sex. The null hypothesis in this study is there is no relationship between age group and sex. Then, we use general loglinear analysis procedure by fitting a loglinear model to predict the odds ratio of the number of preschool Taiwanese aboriginal teachers among age and sex groups.

In this study we assumes the number of preschool Taiwanese aboriginal teachers has a Poisson distribution, and assumes the logarithm of its age group and sex can be modeled by a linear combination of unknown parameters.

ISBN: 978-1-61804-077-0

## 3. Results

Figure 2 and Table 3 shows the number of preschool Taiwanese aboriginal teachers aged from 22 to 29, 30 to 34, 35-39, 40-44, 45-49, 50-54, and 55 above is 12.3%, 16.9%, 21.5%, 13.8%, 16.9%, 15.4%, and 3.1% of total preschool Taiwanese aboriginal teacher.

Overall, the highest percentage of preschool Taiwanese aboriginal teachers falls in the age group of 35 to 39 and teachers of 55 years old or above represent only 3.1% which is the lowest.

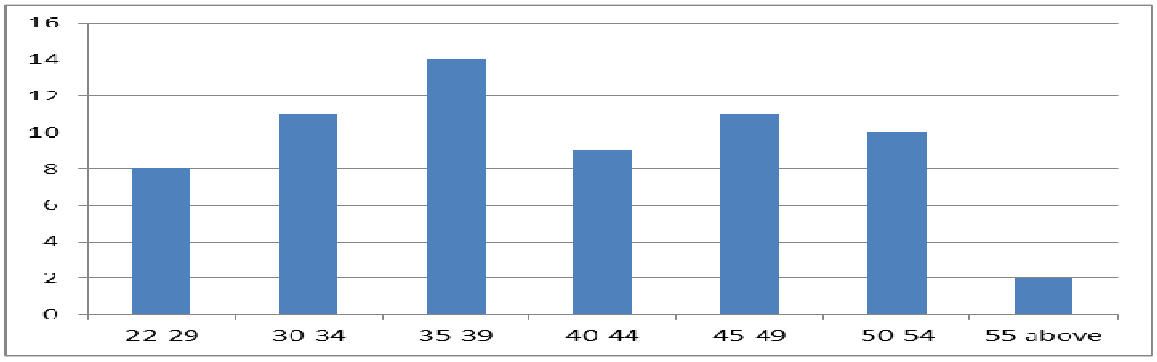


Figure 2. Bar graph of age group

Table 3 frequency table of age group

| Age group | Frequency | Percent (%) |
|---|---|---|
| 22-29 | 8 | 12.3 |
| 30-34 | 11 | 16.9 |
| 35-39 | 14 | 21.5 |
| 40-44 | 9 | 13.8 |
| 45-49 | 11 | 16.9 |
| 50-54 | 10 | 15.4 |
| 55 above | 2 | 3.1 |
| Total | 65 | 100.0 |

Table 4 is the cross table for age group and sex. It shows the expected count and observation value is about the same for preschool Taiwanese aboriginal teachers between their age group and sex group. Table 5 shows the chiq-square test for testing the relationship between age group and sex. We found there is no real relationship between age group and sex for Taiwanese aboriginal teachers in preschool.

From the Table 6, it shows we have strong evidence that the female preschool Taiwanese aboriginal teachers are significantly more than male teachers. We have evidence that the number of preschool Taiwanese aboriginal teachers among age group in 30-34, 35-39, 45-49, and 50-54 are significantly more than age group 55 above by a factor of exp(1.705)=5.5 , exp(1.946)=7.0 , exp(1.705)= 5.5 , and exp(1.609)=5.0 respectively.

ISBN: 978-1-61804-077-0

Table 4 Cross table for age group and sex

| | | sex | | |
|---|---|---|---|---|
| | | Female | Male | Total |
| 22-29 | Count | 8 | 0 | 8 |
| | Expected Count | 7.9 | .1 | 8.0 |
| | % of Total | 12.3% | .0% | 12.3% |
| 30-34 | Count | 11 | 0 | 11 |
| | Expected Count | 10.8 | .2 | 11.0 |
| | % of Total | 16.9% | .0% | 16.9% |
| 35-39 | Count | 13 | 1 | 14 |
| | Expected Count | 13.8 | .2 | 14.0 |
| | % of Total | 20.0% | 1.5% | 21.5% |
| 40-44 | Count | 9 | 0 | 9 |
| | Expected Count | 8.9 | .1 | 9.0 |
| | % of Total | 13.8% | .0% | 13.8% |
| 45-49 | Count | 11 | 0 | 11 |
| | Expected Count | 10.8 | .2 | 11.0 |
| | % of Total | 16.9% | .0% | 16.9% |
| 50-54 | Count | 10 | 0 | 10 |
| | Expected Count | 9.8 | .2 | 10.0 |
| | % of Total | 15.4% | .0% | 15.4% |
| 55 above | Count | 2 | 0 | 2 |
| | Expected Count | 2.0 | .0 | 2.0 |
| | % of Total | 3.1% | .0% | 3.1% |
| Total | Count | 64 | 1 | 65 |
| | Expected Count | 64.0 | 1.0 | 65.0 |
| | % of Total | 98.5% | 1.5% | 100.0% |

Table 5 Chi-square test for age group and sex

| | Value | df | Asymp. Sig. (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 3.700[a] | 6 | .717 |
| Likelihood Ratio | 3.128 | 6 | .793 |
| Linear-by-Linear Association | .142 | 1 | .706 |
| N of Valid Cases | 65 | | |

a. 8 cells (57.1%) have expected count less than 5. The minimum expected count is .03.

Table 6 parameter estimates

**Parameter Estimates[b,c]**

| | | | | | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| Parameter | Estimate | Std. Error | Z | Sig. | Lower Bound | Upper Bound |
| Constant | -3.481 | 1.218 | -2.858 | .004 | -5.869 | -1.094 |
| [sex = female] | 4.159 | 1.007 | 4.128 | .000 | 2.184 | 6.134 |
| [sex = male] | 0[a] | . | . | . | . | . |
| [age group= 22-29] | 1.386 | .791 | 1.754 | .080 | -.163 | 2.936 |
| [age group = 30-34] | 1.705 | .769 | 2.218 | .027 | .198 | 3.211 |
| [age group = 35-39] | 1.946 | .756 | 2.574 | .010 | .464 | 3.427 |
| age group = 40-44] | 1.504 | .782 | 1.924 | .054 | -.028 | 3.036 |
| [age group = 45-49] | 1.705 | .769 | 2.218 | .027 | .198 | 3.211 |
| [age group = 50-54] | 1.609 | .775 | 2.078 | .038 | .091 | 3.128 |
| [age group = 55 above] | 0[a] | . | . | . | . | . |

a. This parameter is set to zero because it is redundant.

b. Model: Poisson

c. Design: Constant + sex + 年齡分層

ISBN: 978-1-61804-077-0

# 4 Conclusions

This study aims to find the association with the number of preschool Taiwanese aboriginal teacher among age group and gender. The conclusions are as follows:

- We found female Taiwanese aboriginal teachers are the majority teaching in preschool, which is 98.5% of total preschool Taiwanese aboriginal teachers.
- The highest percentage of preschool Taiwanese aboriginal teachers falls in the age group of 35 to 39 and teachers of 55 years old or above represent only 3.1% which is the lowest.
- There is no real relationship between age group and sex for Taiwanese aboriginal teachers in preschool.
- We have strong evidence that the female preschool Taiwanese aboriginal teachers affect number of preschool teachers.
- The age group in 30-34, 35-39, 45-49, and 50-54 are significantly affect number of preschool Taiwanese aboriginal teachers
- In 2009, the average age of preschool Taiwanese aboriginal teachers is 40 and each age group all have 8 or above aboriginal teachers. Although we cannot immediately see the teacher retirement rate existing teacher supply which results in aboriginal teacher education gaps but to concern aboriginal students their learning equity and avoid teacher education gaps in the future, we suggest there is a need to make a long term planning on preschool aboriginal teacher education sufficient to support preschool aboriginal education.

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# A Study of Age Distribution of Aboriginal Teachers in Taiwan

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*Abstract:* - The purpose of this study was to analyze the age distribution of aboriginal teachers in Taiwan. Teachers' professional is the fundamental of education, and teachers play the important role in education environment. Aboriginal teachers' multiple roles had inherited the blood of indigenous culture. Their education professional also play a role to extend ethnic culture. The blend of both culture and individual needs force them become a professional learner in the teacher preparation program and also in the teaching professional field. The purpose of this study would explore age distributions of in-service aboriginal teachers in k-12 schools, and the k-12 schools inclusive of kindergartens, elementary schools, junior high schools, senior high schools and senior vocational schools. In this study, a metadata analysis method was applied for exploring the age distribution of in-service aboriginal teachers, the research data would based on project report of teacher education statistics supported by Ministry of Education, Taiwan, R.O.C. The research population is nationwide in-service aboriginal teachers in k-12 schools, total 2,192 at year 2010. About statistical analysis, normal distribution test would be used for analyzing data in this research, inclusive of arithmetic mean, skewness, kurtosis, etc., whether the age distribution is nearly normal distribution curve, positively skewed, or negatively skewed, or generate notch. Finally, about the results of statistic, the age distribution of aboriginal teachers would be presented in the conclusions of this research.

*Key-Words:* - aboriginal teachers; teacher education statistics, age distribution.

## 1 Introduction

Teachers' professional is the fundamental of education, and teachers play the important role in education environment.

Aboriginal teachers' multiple roles had inherited the blood of indigenous culture. Their education professional also play a role to extend ethnic culture. The blend of both culture and individual needs force them become a professional learner in the teacher preparation program and also in the teaching professional field.

In this paper, the research group would based on the education statistics data to analyze the age distribution of aboriginal teachers in k-12 schools, and the k-12 schools inclusive of kindergartens, elementary schools, junior high schools, senior high schools and senior vocational schools.

In this study, a metadata analysis method was applied for exploring the age distribution of in-service aboriginal teachers, the results of age distribution would be as the reference for aboriginal teacher educational strategy development.

The research data collected from 2010 project report of teacher education statistics supported by Ministry of Education, Taiwan, R.O.C.

With the time elapsed that the in-service teachers must to retire and supplement continuously with regular cycle. Generally recognized, novice teachers' teaching experience is lesser than elder teachers, the middle-aged and elder teachers with full extensive experience in teaching. And the novice teachers can enhance self-professional development through communicate with experienced teachers. Therefore, the novice teachers will gradually grow as a professional and experienced teacher with increased age.

ISBN: 978-1-61804-077-0

Most developed world countries have accepted the chronological age of 65 years as a definition of 'elderly' or older person. At the moment, there is no United Nations standard numerical criterion, but the UN agreed cutoff is 60+ years to refer to the older population [1]. In Taiwan, In accordance with regulations, the faculty mandatory retirement age at 65 years old, or can apply for retirement before 65 years old according to individual's years of work experience.

Hence, The researcher considered that the proportions of novice or elder teachers should be lesser than middle-aged teachers in the educational environment, by retire and supplement continuously with a certain regular proportions.

In this research, the age distribution of aboriginal teachers would be analyzed, to understand the age distribution, whether the age distribution is nearly normal distribution curve, or generate notch, or age distribution tends to aging, or ages distribution tend to be younger. The expected of in-service aboriginal teachers' age distribution is nearly or similar to normal distribution curve. The graph of normal distribution shown in figure 1.

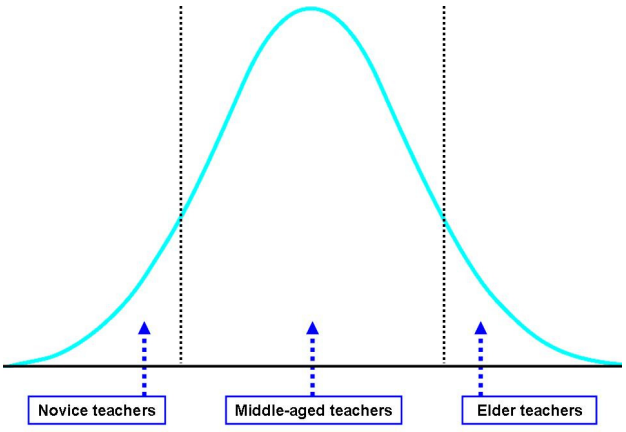


Fig. 1 Expected Age Distribution of In-service Aboriginal Teachers

## 2 Aboriginal tribe and aboriginal teachers in K-12 schools

About the main aboriginal peoples of Taiwan, there are 14 kinds of aboriginal tribe inclusive of Amis, Atayal, Paiwan, Bunun, Puyuma, Rukai, Tsou, Saisiyat, Yami, Thao, Kavalan, Truku, Sakizaya, and Sediq. The graph of aboriginal peoples of Taiwan as shown in figure 2. And the traditional residence areas of aboriginal peoples are eastern half of Taiwan and mountain areas, the residence area distributed as shown in figure 3 [2].

In this research, the age distribution of in-service aboriginal teachers would be analyzed, the in-service teachers in k-12 schools indicated the teachers' first registered specialty in k-12 education. The research data had been divided into five parts: kindergartens, elementary schools, junior high schools, senior high schools and senior vocational schools.

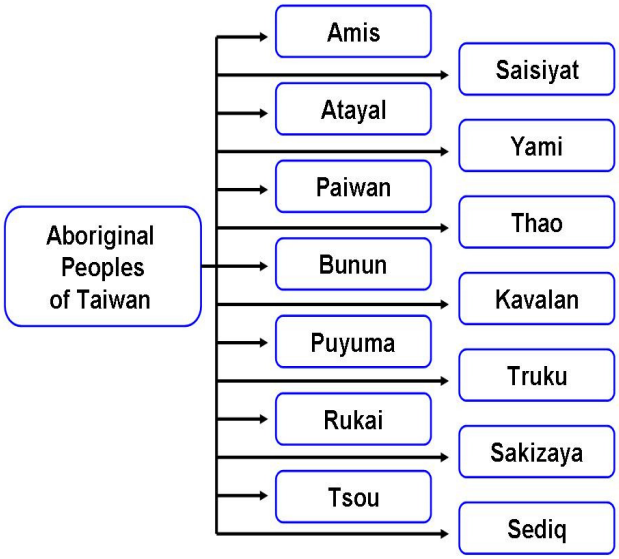


Fig. 2 Aboriginal Peoples of Taiwan


Fig. 3 Traditional residence area of aboriginal peoples in Taiwan [2]

## 3 Problem Solution

In this session, the research methodology, research tools, and statistical analysis are reported. The research findings are also presented as follows.

### 3.1 Methodology

A metadata analysis method was applied in this study for exploring the age distribution of aboriginal teachers in k-12 schools. In this research, the age

data of aboriginal teachers based on the 2010 project report of Teacher Education Statistics. The project supported by Ministry of Education, Republic of China. The research population is nationwide in-service aboriginal teachers in k-12 schools, total 2,192 at year 2010.

## 3.2 Research Tools

In this research, the metadata analysis as the research tool in this research. And the data structure is listed as followings:

- Name of the school level
- Distribution of age group
- Number of people
- Average of age

About the data coding, if the teacher's age under 29 coded as 1, age around 30~34 coded as 2, age around 35~39 coded as 3, age around 40~44 coded as 5, age around 45~50 coded as 6, age around 55~59 coded as 7, and age over 60 coded as 8. Finally, recorded number of people among age group.

All the research data was based on the project report of teacher education statistics and the project had been supported by the Ministry of Education, Taiwan, R.O.C. So this tool and data collected are accurate and effective.

## 3.3 Statistical Analysis

Normal distribution test are used for analyzing data in this research, inclusive of skewness, kurtosis, arithmetic mean. The hypothesis was defined for testing.

- *Hypothesis 1*

*The average age of each school level aboriginal teachers reveals no significant difference.*

- *Hypothesis 2*

*The skewness of each school level aboriginal teachers reveals no significant difference.*

- *Hypothesis 3*

*The kurtosis of each school level aboriginal teachers reveals no significant difference.*

- *Hypothesis 4*

*The average age of aboriginal teachers and general teachers reveals no significant difference.*

Based on four hypotheses were set for statistical test. The test result of the first hypothesis would provide the answer about whether the average age of each school level reveals no significant difference. If not, what is the differences?

The test result of the second hypothesis would provide the answer about whether the skewness of each school level reveals no significant difference. If not, what is the differences?

The test result of the third hypothesis would provide the answer about whether the Kurtosis of each school level reveals no significant difference. If not, what is the differences?

The test result of the fourth hypothesis would provide the answer about whether the average age of aboriginal teachers and general teachers reveals no significant difference. If not, what is the differences?

About the general teachers indicated the teachers are non-aboriginal teachers and first registered specialty in k-12 education. The data of general teachers based on the Yearbook of Teacher Education Statistics published from Ministry of Education, Republic of China [3].

## 3.4 Findings

The results of statistic are presented as follows, inclusive of: descriptive results and hypothesis test results.

### 3.4.1. Descriptive Statistics results

According to age data of aboriginal teachers collected from the project report of teacher education statistics, the tribe proportion of aboriginal teachers were listed in Table 1. And results of normal distribution test inclusive of average age, arithmetic mean, skewness, and kurtosis, were listed in Table 2.

Table 1 The tribe proportion of aboriginal teachers

| Tribe | Number of people | Proportion |
|---|---|---|
| Total | 2192 | 100% |
| Amis | 506 | 23.0% |
| Atayal | 546 | 24.9% |
| Paiwan | 494 | 22.5% |
| Bunun | 239 | 10.9% |
| Puyuma | 104 | 4.74% |
| Rukai | 70 | 3.19% |
| Tsou | 48 | 2.1% |
| Saisiyat | 21 | 0.9% |
| Yamiv | 12 | 0.5% |
| Thao | 5 | 0.2% |
| Kavalan | 1 | 0.04% |
| Truku | 91 | 4.1% |
| Sakizaya | 1 | 0.04% |
| Sediq | 16 | 0.7% |
| others | 38 | 1.6% |

These results of statistic, each tribe proportion shown as the table 1. There are four aboriginal tribes that accounted for 80% of aboriginal teachers. The four aboriginal tribes inclusive of Amis (23.0%), Atayal (24.9%), Paiwan (22.5%), and Bunun (10.9%).

The results of normal distribution test, the

ISBN: 978-1-61804-077-0

mean around 3.13-3.80; all the skewness are positively skewed, the value around 0.163-0.949; and most the kurtosis are platykurtic, the value around (-0.531) ~ (-0.841). In addition, the kurtosis value of senior high school is positive. And the results show all field are not the normal distribution.

About the histograms, the figure 3 shows the normal distribution test results of aboriginal teachers' in k-12 schools and normal curve presented on histograms bottom. And the figure 4 ~ figure 10 show the normal distribution test results of each classification in k-12 schools.

Table 2 Normal distribution test results of aboriginal teachers

| ITEM | Age | Mean | Skewness | Kurtosis |
|---|---|---|---|---|
| Total | 39.06 | 3.45 | 0.308 | -0.588 |
| Male | 40.79 | 3.78 | 0.170 | -0.683 |
| Female | 37.71 | 3.19 | 0.365 | -0.531 |
| kindergarten | 40.79 | 3.80 | 0.171 | -0.713 |
| elementary school | 39.26 | 3.50 | 0.163 | -0.610 |
| junior high school | 38.67 | 3.35 | 0.534 | -0.545 |
| senior high school | 37.53 | 3.13 | 0.949 | 0.380 |
| senior vocational school | 39.20 | 3.42 | 0.571 | -0.841 |

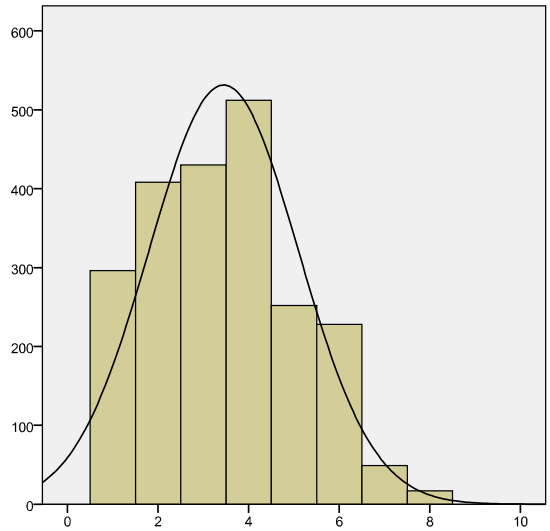

Fig. 3 Normal distribution test of aboriginal teachers' first registered specialty in k-12 schools

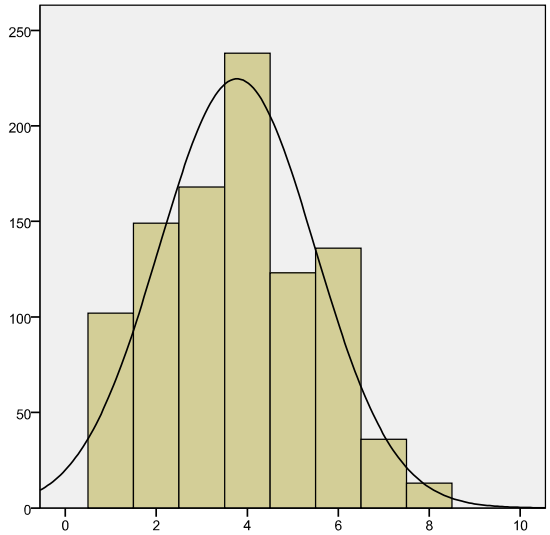

Fig. 4 Normal distribution test of male aboriginal teachers' first registered specialty in k-12 schools

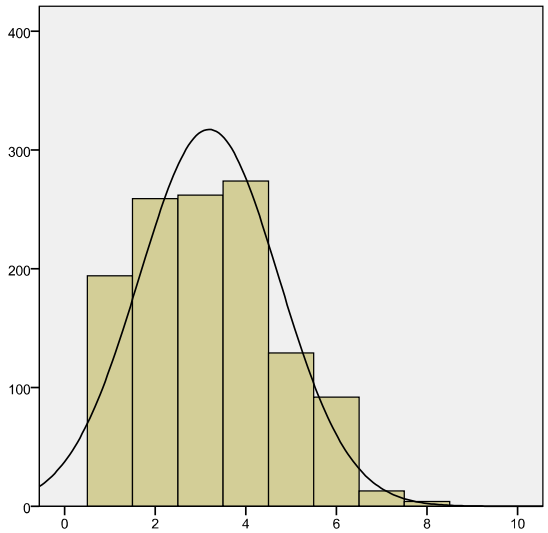

Fig. 5 Normal distribution test of female aboriginal teachers' first registered specialty in k-12 schools

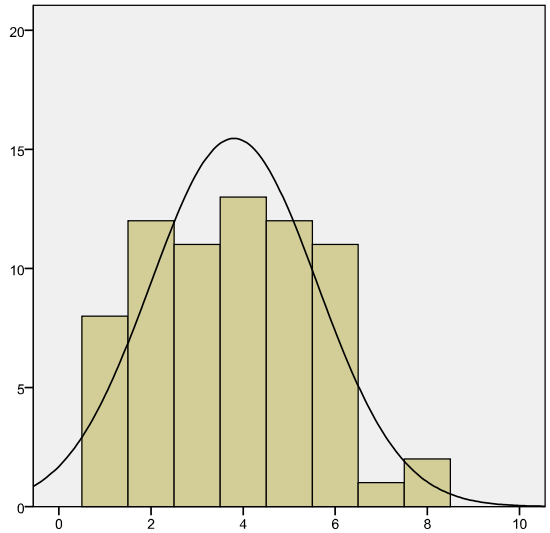

Fig. 6 Normal distribution test of aboriginal teachers' first registered specialty in kindergarten

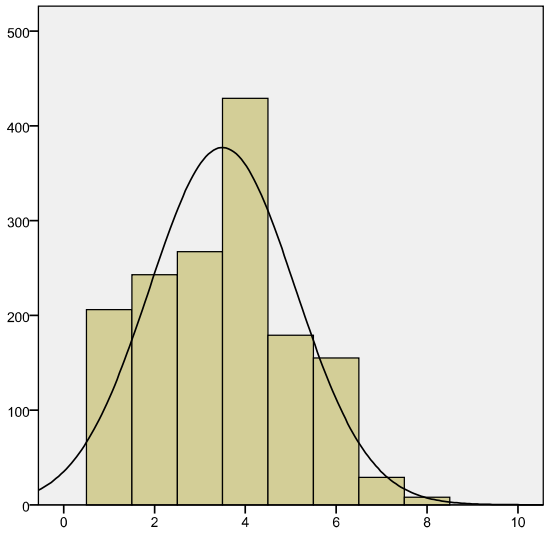

Fig. 7 Normal distribution test of aboriginal teachers' first registered specialty in elementary school

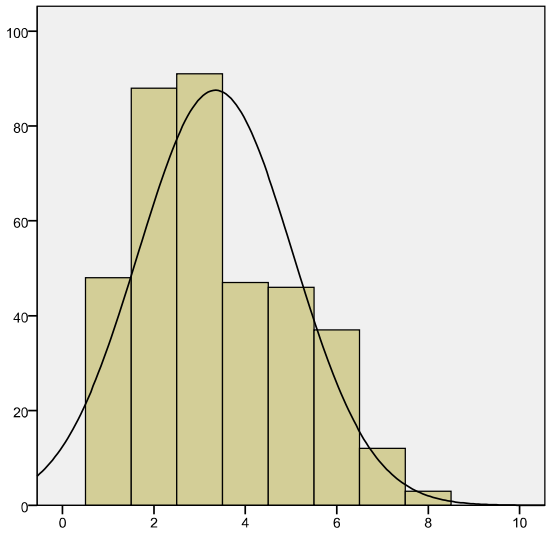

Fig. 8 Normal distribution test of aboriginal teachers' first registered specialty in junior high school

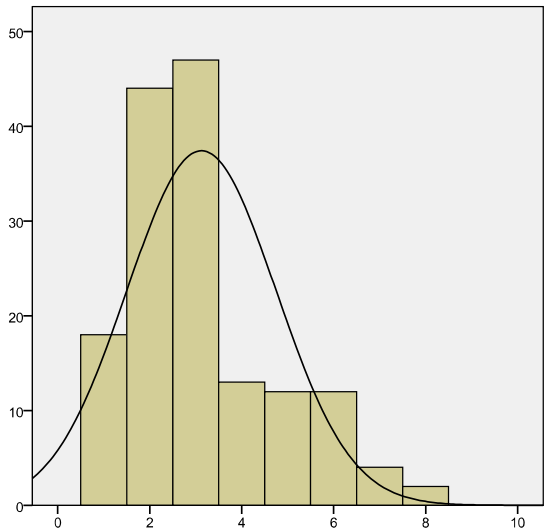

Fig. 9 Normal distribution test of aboriginal teachers' first registered specialty in senior high school

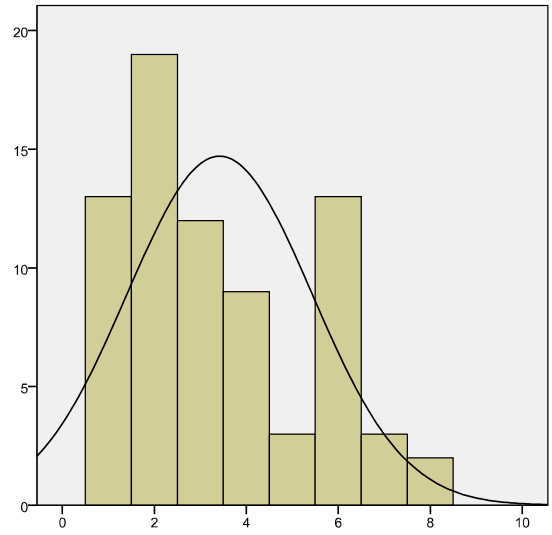

Fig. 10 Normal distribution test of aboriginal teachers' first registered specialty in senior vocational school

About the normal distribution test of aboriginal teachers, the figure 3, 4, 5 shown skewness are positively skewed, that indicated the ages distribution tend to be younger.

And the figure 6, 7, 8, 9 shown skewness are positively skewed, the value around 0.163-0.571, that indicated the ages distribution tend to be younger. And the histograms show the curves are not the normal distribution. In addition, the figure 10 shown the age distribution of senior vocational school, there are a notch between 4~6 apparently.

### 3.4.2. Hypothesis test results

**Hypothesis 1**

About the average age of each school level aboriginal teachers reveals no significant difference. The average age of each school level were listed in Table 2. The results of one-sample test, shows the average age of each school level aboriginal teachers reveals no significant difference. The detailed data as shows in Table 3.

Table 3 one-sample test Results of age average

| One-Sample Test | | | | | | |
|---|---|---|---|---|---|---|
| | Test Value = 39.06 | | | | | |
| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference Lower | Upper |
| School level | .153 | 6 | **.884** | .07571 | -1.1373 | 1.2887 |

**Hypothesis 2**

About the skewness of each school level aboriginal teachers reveals no significant difference. The skewness of each school level were listed in Table 2. The results of one-sample test, shows the skewness of each school level aboriginal teachers reveals no

significant difference. The detailed data as shows in Table 4.

Table 4 one-sample test Results of skewness

| | One-Sample Test | | | | | |
|---|---|---|---|---|---|---|
| | Test Value = 0.308 | | | | | |
| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference Lower | Upper |
| School level | .995 | 6 | .358 | .10957 | -.15984 | 0.37898 |

**Hypothesis 3**

About the kurtosis of each school level aboriginal teachers reveals no significant difference. The kurtosis of each school level were listed in Table 2. The results of one-sample test, shows the kurtosis of each school level aboriginal teachers reveals no significant difference. The detailed data as shows in Table 5.

Table 5 one-sample test Results of kurtosis

| | One-Sample Test | | | | | |
|---|---|---|---|---|---|---|
| | Test Value = -0.588 | | | | | |
| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference Lower | Upper |
| School level | .535 | 6 | .612 | 0.08185 | -0.29274 | 0.45645 |

**Hypothesis 4**

About the average age of aboriginal teachers and general teachers reveals no significant difference. The average age of aboriginal teachers and general teachers were listed in Table 6. The average age data of general teachers based on the Yearbook of Teacher Education Statistics published from Ministry of Education, Republic of China [3].

The results of independent samples test, shows the average age of aboriginal teachers and general teachers reveals no significant difference. The detailed data as shows in Table 7.

Table 6 The average age of aboriginal teachers and general teachers

| Aboriginal teachers | | General teachers | |
|---|---|---|---|
| Classification | Average age | Classification | Average age |
| Total | 39.06 | Total | 39.22 |
| Male | 40.79 | Male | 40.38 |
| Female | 37.71 | Female | 38.65 |
| kindergarten | 40.79 | kindergarten | 38.92 |
| elementary school | 39.26 | elementary school | 39.27 |
| junior high school | 38.67 | junior high school | 38.27 |
| senior high school | 37.53 | senior high school | 40.03 |
| senior vocational school | 39.20 | senior vocational school | 40.27 |

Table 7 Independent Samples Test Results of age average

| Aboriginal teachers | | General teachers | | t |
|---|---|---|---|---|
| N | mean | Std. Deviation | N | mean | Std. Deviation | |
| 8 | 39.126 | 1.2145 | 8 | 39.376 | 0.777 | -0.490 |

p>.05

# 4 Conclusion

According to the results of statistic, conclusions are presented in this section. The purpose of this study was to analyze the age distribution of aboriginal teachers in Taiwan, the research data collected from project report of teacher education statistics. The results of research shows as follows:

1. These results of statistic, each tribe proportion shown as the table 1. There are four aboriginal tribes that accounted for 80% of aboriginal teachers. The four aboriginal tribes inclusive of Amis (23.0%), Atayal (24.9%), Paiwan (22.5%), and Bunun (10.9%).
2. All the normal distribution test of skewness are positively skewed, that indicated the ages distribution tend to be younger.
3. Based the results of statistic, the average age of each school level aboriginal teachers reveals no significant difference.
4. Based the results of statistic, the skewness of each school level aboriginal teachers reveals no significant difference.
5. Based the results of statistic, the kurtosis of each school level aboriginal teachers reveals no significant difference.
6. Based the results of statistic, the average age of aboriginal teachers and general teachers reveals no significant difference.

From the results of this research, the research group found that the age distribution of aboriginal teachers are not normal distribution curve, and the curve of age distribution of senior vocational school generate notch. About the reason that age distribution of senior vocational school generate notch, this issue would be left to the follow-up study.

*References:*

[1] Definition of an older or elderly person. Available at: http://www.who.int/healthinfo/survey/ageingdefnolder/en/index.html/(accessed 03 November 2011).

[2] Distribution of aboriginal peoples. Available at: http://academic.phes.ntct.edu.tw/wp2/wp-content/uploads/2010/11/map_indi_2_thumb.gif (accessed 10 November 2011).

[3] Tai, Chia-Nan., Kuo, Lung-Hsing., Yang, Hung-Jen., and Wei, Huei-Mei. (2009), "Yearbook

of Teacher Education Statistics The Republic of China", available at: www1.inservice.edu.tw/Download/Edu-paper98.pdf (accessed 20 November 2011).

# 國科會補助計畫衍生研發成果推廣資料表

日期:2012/08/10

| 國科會補助計畫 | 計畫名稱: 原住民女性科學教師專業啟蒙的探勘 |
|---|---|
| | 計畫主持人: 楊宏仁 |
| | 計畫編號: 100-2629-S-017-002- 學門領域: 性別與科技研究 |

無研發成果推廣資料

# 100 年度專題研究計畫研究成果彙整表

| | |
|---|---|
| **計畫主持人：**楊宏仁 | **計畫編號：**100-2629-S-017-002- |
| **計畫名稱：**尋找原住民女性科學教師的典範--原住民女性科學教師專業啟蒙的探勘 | |

| 成果項目 | | | 量化 | | | 單位 | 備註（質化說明：如數個計畫共同成果、成果列為該期刊之封面故事...等） |
|---|---|---|---|---|---|---|---|
| | | | 實際已達成數（被接受或已發表） | 預期總達成數(含實際已達成數) | 本計畫實際貢獻百分比 | | |
| 國內 | 論文著作 | 期刊論文 | 0 | 0 | 100% | 篇 | |
| | | 研究報告/技術報告 | 0 | 0 | 100% | | |
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| 國外 | 論文著作 | 期刊論文 | 2 | 1 | 100% | 篇 | 財 Kuo, L.H., Wei, H.-M., & Yang, H.J. (2012). Use the General Log-linear Analysis Procedure to Study Taiwanese Aboriginal Teachers in Junior High School, INTERNATIONAL JOURNAL OF EDUCATION AND INFORMATION TECHNOLOGIES |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | Regression Model to Study Primary school Aboriginal Teachers in Taiwan, INTERNATIONAL JOURNAL OF EDUCATION AND INFORMATION TECHNOLOGIES, 6(2), pp.209-216. (EI) |
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| | | | | | | | 財 Use General Log-linear Analysis |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | Science and Education, p133-138, ISBN: 978-1-61804-077-0<br>財 Use the General Log-linear Analysis Procedure by Fitting a Log-linear Model with Age Group and Gender as Factors for Preschool Aboriginal Teachers in Taiwan, Recent Researches in Communications, Information Science and Education, p139-144, ISBN: 978-1-61804-077-0<br>財 A Study of Age Distribution of Aboriginal Teachers in Taiwan, Recent Researches in Communications, Information Science and Education, p145-151, ISBN: 978-1-61804-077-0 |
| | | 專書 | 0 | 0 | 100% | 章/本 | |
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| | | 博士生 | 0 | 0 | 100% | | |
| | | 博士後研究員 | 0 | 0 | 100% | | |
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| | 成果項目 | 量化 | 名稱或內容性質簡述 |
|---|---|---|---|
| 科教處計畫加填項目 | 測驗工具(含質性與量性) | 0 | |
| | 課程/模組 | 0 | |
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請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現或其他有關價值等，作一綜合評估。

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估

■達成目標

□未達成目標（請說明，以 100 字為限）

□實驗失敗

□因故實驗中斷

□其他原因

說明：

2. 研究成果在學術期刊發表或申請專利等情形：

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本案透過實證資料分析釐清女性科學教師啟蒙脈絡，並建立女性科學教師專業啟蒙模式，將近五十年的專業啟蒙結構化。初步研究成果參與研討會提出口頭宣讀與討論並收錄至正式出版之論文集中，共計四篇，期刊發表兩篇：

財 Study the Relationship between Age Group and Gender of Taiwanese Aboriginal Teachers in Junior High School by Using Poisson Regression model, Recent Researches in Communications, Information Science and Education, p127-132, ISBN: 978-1-61804-077-0

財 Use General Log-linear Analysis Procedure Analyzes the Frequency Counts of Taiwanese Aboriginal Primary School Teachers Falling into each Age Group and Gender Category in a Cross-tabulation Table, Recent Researches in Communications, Information Science and Education, p133-138, ISBN: 978-1-61804-077-0

財 Use the General Log-linear Analysis Procedure by Fitting a Log-linear Model with Age Group and Gender as Factors for Preschool Aboriginal Teachers in Taiwan, Recent Researches in Communications, Information Science and Education, p139-144, ISBN: 978-1-61804-077-0

財 A Study of Age Distribution of Aboriginal Teachers in Taiwan, Recent Researches in Communications, Information Science and Education, p145-151, ISBN: 978-1-61804-077-0

财 Kuo, L.H., Wei, H.-M., & Yang, H.J. (2012). Use the General Log-linear Analysis Procedure to Study Taiwanese Aboriginal Teachers in Junior High School, INTERNATIONAL JOURNAL OF EDUCATION AND INFORMATION TECHNOLOGIES, 6(2), pp. 201-208. (EI)

财 Kuo, L.H., Yang, H.H., Yang, H.J., Ko, S.P., & Huang, H.C. (2012). Use the Poisson Regression Model to Study Primary school Aboriginal Teachers in Taiwan, INTERNATIONAL JOURNAL OF EDUCATION AND INFORMATION TECHNOLOGIES, 6(2), pp.209-216. (EI)

本案提出之發現將可為原住民專業化發展之參酌，為科技專業人力資源發展研究紮根，亦為師資培育專業成長上落實基礎研究工作。