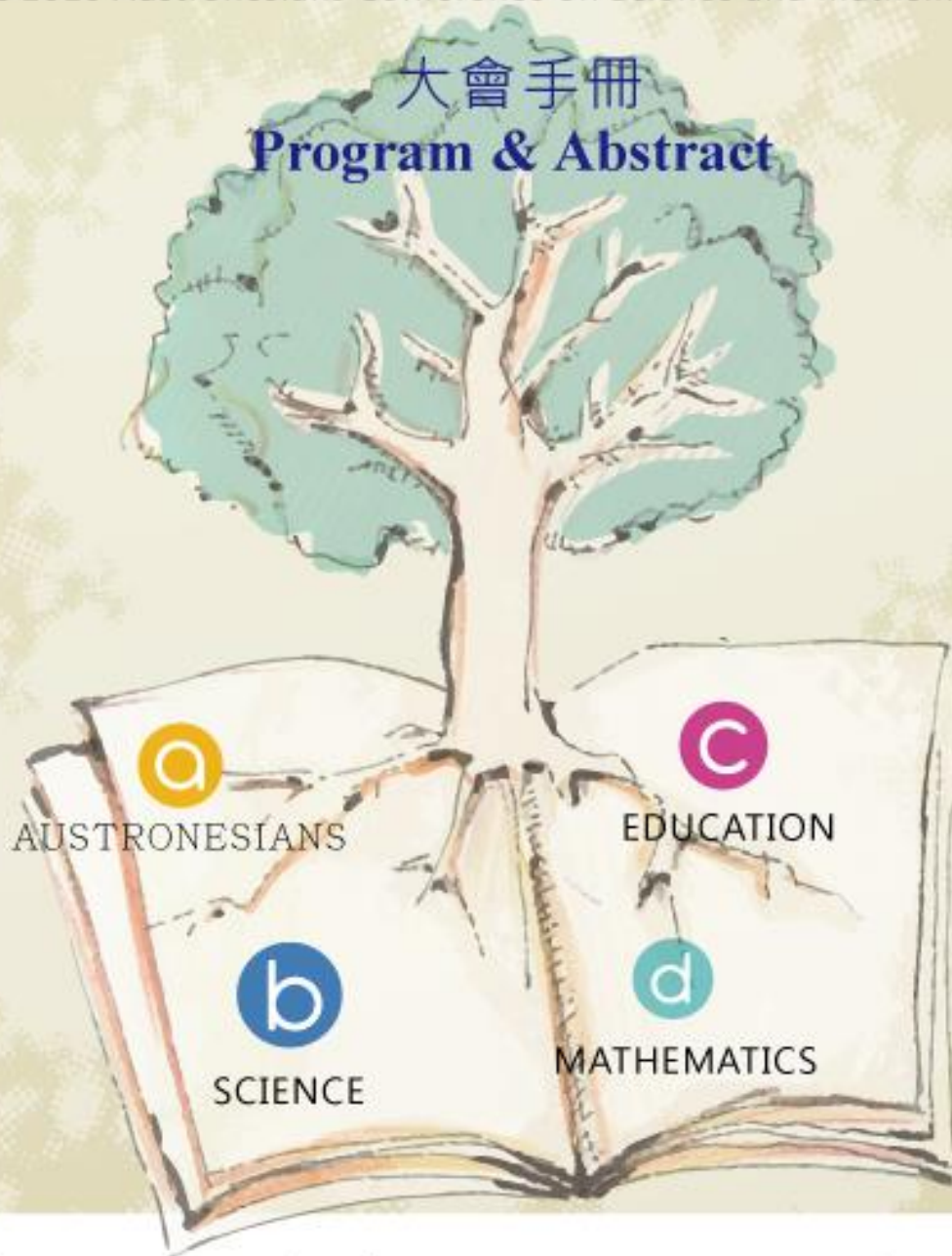


2016年南島民族 科學與數學教育學術研討會

The 2016 Austronesians Conference on Science and Mathematics Education



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壹、議程表 Program

2016 年 11 月 11 日 (星期五) 專題演講與交流 Keynote Speech (地點：國立臺東大學 師範學院 淑真講堂) Teachers College Shuzhen Lecture Hall, NTTU 臺東市大學路二段 369 號 369, Section II, University Road, Taitung, Taiwan	
時間 Time	活 動 內 容 Activity
13:10~13:30	報到 / Registration
13:30~13:45	開幕式 / Opening Ceremony
	國立臺東大學校長 曾耀銘博士致詞 Opening Remarks by Dr. Yaoming Zeng, President of National Taitung University 頒發外賓及特別來賓感謝狀 Introduction & Awarding of Distinguish Guests
	大合照 Group photo
13:45~15:15	A1：專題演講一 / Keynote Speech I
	主持人：郭重吉講座教授 國立彰化師範大學科學教育研究所 (主持、介紹、提問、討論共 20~30 分鐘) Moderator: Chorng-Jee Guo, Chair Professor, National Institute of Science Education, Normal Changhua University of Education, Taiwan 演講人： Keynote Speaker：Professor Karen C. Liu Department of Teaching and Learning, Bayh College of Education, Indiana State University, U.S.A. 講題/Topic：Planning the Seeds for STEM Learning: Start with Young Children.
15:15~15:30	交流及休息時間 Break
15:30~17:00	A2：專題演講二 / Keynote Speech II
	主持人：李慧娟副教授 慈濟大學兒童發展與家庭教育學系 (主持、介紹、提問、討論共 20~30 分鐘) Moderator: Hui-Chuan Li, Associate Professor, Department of Child Development and Family Studies, Tzu Chi University, Taiwan

	演講人： Keynote Speaker : Dr. Jyrki Reunamo Department of Teacher Education, University of Helsinki, Finland 講題/Topic : Early Childhood Education and the Aborigines in Finland (Sami people).
17:00	散會

2016 年 11 月 12 日 (星期六) 學術研討會 Seminar (地點：國立臺灣史前文化博物館 國際會議廳) International Conference Hall, National Museum of Prehistory 臺東市豐田里博物館路 1 號 1 st , Museum Road, Taitung, Taiwan	
時間 Time	活動內容 Activity
08:10~08:30	報到 / Registration
08:30~09:10	開幕式—貴賓致詞 (預計共 5 位每位 3~5 分鐘) Opening Ceremony
	<ul style="list-style-type: none"> ◆ 國立臺東大學學術副校長兼理工學院院長 張永明博士致詞 Dr. Yung-Ming Chang, Academic Vice President and Dean of Polytechnic Institute of National Taitung University ◆ 臺東縣政府代表致詞 Taitung County Government representative ◆ 科技部科教發展及國際合作司代表致詞 Department of International Cooperation and Science Education of Ministry of Science and Technology representative ◆ 國立臺灣史前文化博物館館長 張善楠博士致詞 Dr. Shan-Nan Chang, Director of National Museum of Prehistory ◆ 計畫主持人 熊同鑫教授致詞 Professor Tung-Hsiung Hsiung, Principal Investigator
	大合照 / Group photo
9:10~9:20	休息時間 Break
9:20~10:50	B1：專題演講三 / Keynote Speech III

	<p>主持人：郭重吉講座教授 國立彰化師範大學科學教育研究所 (主持、介紹、提問、討論共 15 分鐘)</p> <p>Moderator: Chorng-Jee Guo, Chair Professor, National Institute of Science Education, Normal Changhua University of Education, Taiwan</p> <p>主講人： Keynote Speaker：Professor Margaret J. Maaka College of Education, University of Hawai‘i at Mānoa, U.S.A.</p> <p>講題/Topic：Ho‘okulāiwi: Community Partnerships in Education as the Foundation to Building Strong and Healthy Indigenous Peoples and Nations.</p>
10:50~11:20	<p>休息時間（茶敘及海報、教案、教材展示交流） Tea/Coffee Break</p>
11:20~12:40	<p style="text-align: center;">B2：論文徵文口頭發表場次一 / Paper Session I</p> <p>主持人：高慧蓮教授 國立屏東大學科普傳播學系(含數理教育碩士班)系主任（主持、提問、討論共 10~15 分鐘）</p> <p>Moderator: Huey-Lien Kao, Professor & Chair of Department of Science Communication, National Pingtung University, Taiwan.</p> <p>評論人一/Discussant：黃思華副教授 臺北市立大學 教育學系 Tzu-Hua Huang, Associate professor, Department of Education in University of Taipei, Taiwan.</p> <p>評論人二/Discussant：李馨慈助理教授 國立屏東大學 原住民族健康休閒與文化產業學士學位學程專班兼國立屏東大學原住民族教育研究中心主任 Shing-Tsz Lee, Director of the Indigenous Education and Research Center, and Assistant Professor, “Studies of Health and Leisure & Cultural Industries for Indigenes” B. A. Program, National Pingtung University, Taiwan.</p> <p>◆ （統一回應 10~20 分鐘）</p> <p>徵稿論文發表/Paper Session：3 篇（每人 8~15 分鐘）</p> <ul style="list-style-type: none"> ◆ 布農族孩童對飛行的想像與創造～「想飛」幼兒科學探索課程中教與學的對話－陳淑芳、朱惠慧 Eager to fly: Bunun kids’ imagination and creative thinking regarding the design of flying things-- Shu-Fang Chen & Hui-Hui Zhu ◆ 原住民學童閱讀一般數學教材與文化數學教材之腦波比較--林志鴻 Comparison of Brainwave for Indigenous Students’ Reading Toward

	<p>to General and Culture Mathematics Materials-- Chih-Hung Lin</p> <ul style="list-style-type: none"> ◆ 原民智慧的科學體驗課程設計研究-- 柳佩好、李文獻、呂明蓁 <p>A Research on the Scientific Experience Curriculum Design of Indigenous Wisdom-- Pei-Yu Liu & Wen-Shian Lee & Meg M. Lu</p>
12:40~14:10	午餐時間 / Lunch
	B3：專題演講四 / Keynote Speech IV
14:10~15:40	<p>主持人：陳淑芳副教授 國立臺東大學幼兒教育學系系主任 (主持、介紹、提問、討論共 15 分鐘)</p> <p>Moderator: Shu-Fang Chen, Associate Professor and Chair of Department, Department of Early Childhood Education, National Taitung University, Taiwan.</p> <p>主講人： Keynote Speaker：Associate Professor Jenny Ritchie School of Education, Victoria University of Wellington, New Zealand</p> <p>講題/Topic：Facilitating Young Children's Science Explorations and Understandings via a Dual Onto-Epistemological Lens, One that Honours both Indigenous and Western Notions: A Perspective from Aotearoa New Zealand.</p>
15:40~16:10	休息時間（茶敘及海報、教案、教材展示交流） Tea/Coffee Break
	B4：論文徵文口頭發表場次二 / Paper Session II
16:10~17:30	<p>主持人：王前龍副教授 國立臺東大學教育學系 (主持、提問、討論共 10~15 分鐘)</p> <p>Moderator: Chien-Lung Wang, Associate Professor, Department of Education, National Taitung University, Taiwan.</p> <p>評論人一/Discussant：樂鏞·祿璞峻岸副教授 國立成功大學地球科學系 Ljegay Rupeljengan, Associate Professor, Department of Earth Sciences, National Cheng Kung University, Taiwan.</p> <p>評論人二/Discussant：羅永清助理教授 長榮大學台灣研究所助理教授兼原住民專班執行秘書 Yung-Ching Lo, Assistant Professor, Institute of Taiwan Studies, Area of Indigenous Pedagogy & Chang Jung Christian University, Taiwan.</p> <ul style="list-style-type: none"> ◆ (統一回應 10~20 分鐘) <p>徵稿論文發表/Paper Session：3 篇 (每人 8~15 分鐘)</p>

	<ul style="list-style-type: none"> ◆ 原住民學童接受文化融入自然與生活科技教學之研究-- 高慧蓮、張祈良 A study research for indigence students receiving culture into the teaching of science and technology-- Huey-Lien Kao & Chi-Liang Chang ◆ 原住民學童數位 CPS 面積與體積五感課程發展與建置之研究-- 簡靖樺、黃思華 The Establishment and Development of Aboriginal Students' CPS and Five Senses in Digital Area and Volume Classes-- Ching-Hua Chien & Tzu-Hua Huang ◆ 幼兒園實施布農族文化適性教學之行動研究-- 朱惠慧、陳淑芳 Culturally and Developmentally Appropriate Practice for Bunun Kids-- Hui-Hui Zhu & Shu-Fang Chen
10:50~11:10 15:40~16:10	<p style="text-align: center;">B5：海報論文及教材、教案展示（地點：國際會議廳前走廊） Posters and Teaching Materials</p> <p>錄取海報 9 篇：Poster Session</p> <ul style="list-style-type: none"> ◆ 提昇排灣族學童數理競爭力與科普活動之研究-- 高慧蓮、陸怡琮、施焜耀、李馨慈、林志隆 A Study for enhance students mathematical Paiwan competitiveness and science activities-- Huey-Lien Kao, I-Chung Lu, Kun-Yauh Shih, Shing-Tsz Lee, Chih-Lung Lin ◆ 數學部落教室中的原民族文化數學教材發展-- 姚如芬、吳孟純 Math Classroom in the Tribe — Development of culture-based mathematics instructional modules-- Ru-Fen Yao & Meng-Chun Wu ◆ 原住民學童的幾何概念理解-- 李秀妃 The Conceptual Understanding of Geometry of Indigenous Children-- Hsiu-Fei Lee ◆ 國民小學學生參與非制式化科學教育活動營之研究-- 林春鳳、鄭清平、陳盈靜、楊坤璋 The study of Elementary Schools Students join the Science Education Camp-- Chung-Feng Lin, Ching-Ping Cheng, Ying-Jing Chen, Kun-Chang Yang ◆ 原住民學校奈米科技新知電子書之研究-動物中的奈米-- 施焜耀、巫毓翊、韓鎮遠、戴呈宇、黃瑋玲 A study of indigence schools in Nanotechnology with e-books - Nano in animals-- Kun-Yauh Shih, Yu-Yi Wu, Zhen-Yuan Han, Chen-Yu Dai, Cheng-Ling Huang ◆ 發展與應用數位學習系統縮短原住民數學學習落差之研究-- 林志隆、高慧蓮、徐偉民、陸怡琮、施焜耀、李馨慈 Study on Developing and Applying Digital Learning System to Shorten the Mathematical Learning Gap in Aboriginal Students--

Chih-Lung Lin, Huey-Lien Kao, Wei-Min Hsu, I-Chung Lu, Kun-Yauh Shih, Shing-Tsz Lee

- ◆ 走活傳統-從數學語意出發的民族數學-- 楊晉民、魏士軒、陳嘉皇

Vitalization of Tradition—Ethnomathematics Based on Mathematical Semantics-- Jinn-Min Yang, Shih-Hsuan Wei, Chia-Huang Chen

- ◆ 民族數學師資培育與專業發展-- 魏士軒、楊晉民、陳嘉皇
Teacher Cultivation and Professional Development: a Case Study of Ethnomathematics-- Shih-Hsuan Wei, Jinn-Min Yang, Chia-Huang Chen

- ◆ 南排灣族數位文化融入式健體實驗課程—健康體位知識成效研究-- 華國媛、王凱倫

The Effectiveness Of Cultural Inclusive Health Education Pedagogy for Taiwan Indigenous-the outcome of learning healthy knowledge in Paiwan tribe Elementary Students-- Kuo-Yuan Hwa & Kai-Lung Wang

教案教材展示 5 篇：Teaching Materials

- ◆ 數位教材—映射與堆疊-- 趙貞怡、黃意涵、高筱綺
Digital Materials—“Mapping and Stacking”-- Jen-Yi Chao, Yi-Han Huang, Hsiao-Chi Kao

- ◆ 原住民學童接受文化融入自然與生活科技教學之研究教材展示—以簡單機械為例-- 高慧蓮、張祈良

Explore the Effectiveness of Science Stories E-book Learning Outcomes of Han and Indigenous Elementary School Children: Taking a Simple Mechanical Unit as an Example-- Huey-Lien Kao & Chi-Liang Chang

- ◆ 原住民族非制式化科學教育活動營教案--排灣族、阿美族、布農族、雅美族、魯凱族-- 林春鳳、鄭清平、陳盈靜、楊坤璋

Lesson Plan Development for an Indigenous Informal Science Education Camp-- Chung-Feng Lin, Ching-Ping Cheng, Ying-Jing Chen, Kun-Chang Yang

- ◆ 賽德克族文化融入小學二年級數學概念之教材設計-- 賴柏翰、陳彥廷

The material Design of the second grade Mathematic Conception in Seediq-- Bo-Han Lai & Yan-Ting Chen

- ◆ 原住民學童數位CPS面積與體積五感課程發展與建置之研究教材—簡靖樺、黃思華

The Establishment and Development of Aboriginal Students' CPS and Five Senses in Digital Area and Volume Classes-- Ching-Hua Chien & Tzu-Hua Huang

於國際會議廳外走道設展板與展桌展示，發表回應時段發表人或代表人將在現場回應互動

17:30~17:40	頒發發表證書 / Award Certificate
17:40	散會

<p align="center">2016 年 11 月 13 日 (星期日) 綜合討論與交流合作對談 Symposium (地點：國立臺灣史前文化博物館 中型會議室) Medium-Sized Conference Room, National Museum of Prehistory 臺東市豐田里博物館路 1 號 1st, Museum Road, Taitung, Taiwan</p>	
時間 Time	活動內容 Activity
09:15~09:30	報到 / Registration
	C：綜合討論與合作對談 / Symposium
09:30~11:30	<p>主持人：郭重吉講座教授 國立彰化師範大學科學教育研究所 Moderator: Chorng-Jee Guo, Chair Professor, National Institute of Science Education, Normal Changhua University of Education, Taiwan</p> <p>引言人一/Panelist：熊同鑫教授 國立臺東大學 幼兒教育學系教授兼原住民族教育及社會發展研究中心主任 Tung-Hsing Hsiung, Professor, Department of Early Childhood Education, and Chief of Research Center for Indigenous Education and Social Development, National Taitung University, Taiwan. (Introduction)</p> <p>引言人二/Panelists：4 位整合型計畫總計畫主持人及個別型計畫代表簡述所屬組別內之研究計畫方向與內容 (每人 6~12 分鐘)。</p> <ul style="list-style-type: none"> - 汪明輝副教授 國立臺灣師範大學地理學系兼原住民族委員會副主任委員 Tibusungu 'e Vayayana, Associate Professor, Department of Geography, National Taiwan Normal University & Vice President, Council of Indigenous Peoples - 趙貞怡教授 國立臺北教育大學-課程與教學傳播科技研究所 Jen-Yi Chao, Professor, Graduate School of Curriculum and Instructional Communications and Technology, National Taipei University of Education, Taiwan. - 高慧蓮教授 國立屏東大學科普傳播學系(含數理教育碩士班) Huey-Lien Kao, Professor & Chair of Department of Science Communication, National Pingtung University, Taiwan. - 姚如芬教授 國立嘉義大學數理教育研究所

	<p>Ru-Fen Yao, Professor & Director, Graduate Institute of Mathematical and Science Education, National Chiayi University, Taiwan.</p> <ul style="list-style-type: none"> - 林春鳳副教授 國立屏東大學體育系 <p>Chung-Feng Lin, Associate Professor, Department of Physical Education, National Pingtung University, Taiwan.</p> <p>引言人三/Panelists：四位國外學者，以簡述個人研究專長，以及近年研究團隊所進行之研究方向與內容(每人 6~12 分鐘)。</p> <ul style="list-style-type: none"> - Professor Karen C. Liu, Department of Teaching and Learning, Bayh College of Education, Indiana State University, U.S.A. - Dr. Jyrki Reunamo, Department of Teacher Education, University of Helsinki, Finland - Professor Margaret J. Maaka, College of Education, University of Hawai'i at Mānoa, U.S.A. - Associate Professor Jenny Ritchie, School of Education, Victoria University of Wellington, New Zealand <p>與談人/Project Principal Investigators： 所有計畫主持人，請以 5~8 分鐘自我介紹，並簡略介紹研究專長與領域</p> <p>此座談目的，乃期望各計畫間相互了解並形成議題對談，或促成協作可能性的發展。針對有關原住民科學與數學研究本期程的回顧與困境加以分析，期待下一期程方向與願景的建議，或設想國際合作研究的可能性與方式。</p>
11:30~12:30	午餐 / Lunch
12:30	賦歸 / Closing Remarks

特別說明	<ul style="list-style-type: none"> ◇ 本次研討會特別與史前館合作，與會人員如利用 11、12 日空檔時間欲參觀史前館展覽者，請務必配帶研討會參加證，至史前館大廳售票服務臺按研討會報名表登記入館參觀，不需另購門票，參觀費用由本會統一支付。未報名參與研討會人員，請自行支費參觀費用，謝謝！ ◇ 11 月 12 日週六中午 13:10 將安排一場史前館英語導覽，有興趣者可至大廳等候，其他中文導覽時間請按館內說明等候，或自行參觀時，以手機掃瞄展品 QR Code 即可獲得展品資訊。
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貳、論文徵文口頭發表摘要 Paper Sessions I & II Abstract

布農族孩童對飛行的想像與創造～「想飛」 幼兒科學探索課程中教與學的對話

陳淑芳¹ 朱惠慧²

摘要

本研究探究布農族幼兒的飛行概念、自然探究興趣和能力、科學創造力及環境保護意識的萌發。乃以布農族幼兒對於小小鳥學飛的興趣為探究起點，本文將分享一群布農族幼兒從觀察天空飛行事物，進而展開一系列有關飛行與飛行物設計改良的「想飛」課程探究學習之旅。

因處於山區部落，幼兒在抬頭之際常能看見大冠鷲翱翔於空中，也不時看到 pilapila (布農族語-直升機)從校園天際劃過，小小身影總愛追逐著 pilapila 又喊又叫，直到它消失在山的另一頭。在日常遊戲中常觀察到幼兒建構飛行物體，或在戶外遊戲場扮演飛行員：「坐好了！飛機要起飛囉！」，就像個訓練有素的飛行員。基於幼兒自發展現出對飛行的想像與渴望，促使我們想瞭解布農族幼兒對天空中飛行事物的探究興趣與概念發展，並且研發以天空中事物進行幼兒科學探索課程之可行性。

本研究以臺東一個布農族國小附幼為研究場域，參與對象為 16 名小、中、大混齡班級幼兒。資料來源為幼兒學習觀察記錄、幼兒表徵作品、以及教學省思手札等文件；資料分析乃以質性資料分析法和真實性檔案評量，從課程脈絡解析幼兒的想法、探究能力及科學創造力的展現，並瞭解教學後幼兒對天空中飛行事物的概念、探究能力及科學創造力的改變及對環境議題的關注情形。

本研究發展出一個依據布農族幼兒生活經驗和探究興趣而展開的師生共構課程，幼兒從親鳥育雛的觀察經驗為出發，進一步探究幼鳥學飛的歷程，也從各種鳥類學飛的影片中，綜合歸納小小鳥學飛的要素與條件。並從觀察天空中會飛的事物，探討「什麼是飛？」、「會飛的事物」、「如何才能飛」、「飛行的軌跡」、「飛行物設計改良」、「飛行物大展」；以及從「老鷹想飛」紀錄片的探討，發現老鷹減少與環境變化的關連性。

課程展開與實施之後，發現：一、飛行發展演進的故事引發幼兒對空中飛行事物的探究興趣，也帶動了對飛行相關概念的探究，教學後發現幼兒的探究能力、科學態度及科學創造力的進步。二、幼兒從紙飛盤、紙蜻蜓到紙飛機的改造歷程中表現積極與高度的研究改進思考的創造興趣。三、從老鷹消失的紀錄片中幼兒展現對自然生態變遷的關注，幼兒提出對於大冠鷲的保護策略，看得出他們能夠珍惜部落裡的大冠鷲，並萌發出對自然生態環境的關懷行動力。

關鍵詞：幼兒教育、布農族、自然探索、科學探究能力、科學創造力思考、飛行概念

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Eager to Fly: Bunun Kids' Imagination and Creative Thinking Regarding the Design of Flying Things

Shu-Fang Chen¹ Hui-Hui Zhu²

Abstract

The study explores Bunun children's concept of the flight, natural interests and scientific exploratory ability, the emergence of scientific creativity, as well as environmental awareness. With children's interest in observing young birds learning to fly, this study shares the learning journey of a group of Bunun children who study flying things in the sky and explore how to design flyers and paper planes through serious play for a period of three-month.

The study identifies key elements for successful scientific exploration and creative problem solving teaching for Bunun young children. The development of children's scientific concepts, scientific process skills as well as creative scientific thinking and problem solving abilities were evaluated.

Keywords: childhood education, Bunun, scientific exploratory ability, creative scientific thinking, flying things

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原住民學童閱讀一般數學教材與文化數學教材之腦波比較

林志鴻¹

摘要

本研究透過可攜式腦波儀之設備與技術，針對本研究團隊所開發之文化數學教材，以及其他出版社所出版之一般數學教材，進行原住民學童在閱讀兩種不同教材時之腦波表現比較。過去的研究在探究數學學習議題時，大部分都是以前後測答對率、問卷、訪談以及外顯行為等測量方式來呈現研究發現。這些方式比較偏向事後的觀察，而無法知道學生在學習當下的腦波思維狀況，然而，透過觀察腦波將可以解決這個問題。由於過去腦波儀器的體積龐大，且週邊所需配件繁多，因此大部份研究場域僅限制在實驗室裡；隨著科技的進步，腦波儀裝置已走向可攜式設計，採用可攜式腦波儀之相關研究也越來越被重視。然而，在近五年來採用可攜式腦波儀之相關研究中，幾乎沒有研究議題專注於探討原住民族學童學習時之腦波表現。因此，本研究將比較過去三年裡由計畫團隊所開發的文化數學教材，與其他出版社所出版之一般數學教材，對於原住民學童在閱讀行為時所表現的腦波差異。本研究將透過腦波儀收集原住民學童在閱讀兩種不同數學版本教材時之腦波，透過神念科技之腦波專利轉換成專注度與放鬆度，並採用腦波折線圖呈現原住民學童閱讀兩種版本時的專注度與放鬆度之比較。實驗結果將有助於未來開發文化數學教材時之重要參考，同時，未來本研究將配合眼動儀一起收集相關學習數據，以整合更多面向的資料與提供更具說服力的研究發現。

關鍵詞：腦波、專注度、放鬆度、文化數學

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Comparison of Brainwave for Indigenous Students' Reading toward to General and Culture Mathematics Materials

Chih-Hung Lin¹

Abstract

This study compared the brainwave of indigenous students when they read two different kinds of mathematics materials: one developed by general publisher, and another culture one developed by our research team. For the past studies related mathematics issue, most research findings were constructed by accurate rate of pre-/post- test, questionnaire, review, and explicit behavior, however, these measures were the observations after the event, but not include to understand the real-time thinking, nevertheless, brainwave device can reach it. Fortunately, the brainwave devices nowadays are portable, unlike traditional huge design, therefore, related applications and studies are respected nearly five years. However, very few related studies focus to observe and understand the brainwave of indigenous students in learning. Therefore, this study compared two factors, attention and meditation, when indigenous students reading two different kinds of mathematics material. The attention and meditation factors were derived from brainwave coefficients and designed by NeuroSky potent algorithm. The result findings are contributive to refine the design of culture mathematics materials, and this study then future combine the eye-tracking to measure and collect more data related indigenous students' learning in order to integrate more dimensional data and offer more persuasive research findings.

Keywords: brainwave, attention, meditation, culture mathematics

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原民智慧的科學體驗課程設計研究

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摘要

當文化遇上科學，科學因文明的豐富性而呈現多樣化，如此，文化與科學的對話正可以用來發展創意的教材。本文利用臺南市原住民族教育資源中心的文物為基本文化素材，配合情境教學 (Situating Teaching)，發展「原民智慧—科學不一樣」課程，讓學生習得科學不一定只發生在實驗室中，透過展覽館真實情境的連結設計導向，來引發學生學習動機。利用文物館來打破情境空間的限制，有效的情境教學能促使學生主動學習，積極主動去想像、思考、解決文題。本課程設計以臺灣原住民族中有海洋民族之稱的達悟族人，其打造tatala拼板舟成為出海捕魚的重要生活工具，也是一種可以科學原理來加以解讀之文明產物，以文化來導入科學，學生不只是在學習早期原住民族智慧的文化傳遞，更能與現有的正規教材中的科學知識相輔相成，學生的學習負荷低，以學生為學習中心，在文物館中透過實體tatala，及多媒體影音交互學習下，學生在多元的環境中互動學習，進而建構發展出自身的能力。期待能在推展原住民族文化時能以不同的觀點來探究，讓學生能更深入了解先民的智慧。

關鍵詞：情境教學、拼板舟、原民智慧、多媒體

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A Research on the Scientific Experience Curriculum Design of Indigenous Wisdom

Pei-Yu Liu¹ Wen-Shian Lee² Meg M. Lu³

Abstract

When culture meets science and science is diversified by the richness of civilization, a dialogue between culture and science can be used to develop creative materials. In this paper, the cultural heritage of the Indigenous Education Resource Center in Tainan City is used as the basic cultural material, and the “Indigenous Wisdom - Science is not the same” course is developed to support the teaching of Situational Teaching. Through the design of the exhibition hall real-life link, to motivate students to learn. Use of cultural relics to break the constraints of contextual space, effective situational teaching can promote students to learn, take the initiative to imagine, think, solve the problem. This course is designed to the Taiwan indigenous in the marine nation known as the Tao, the tatala punt boat to become an important life tool for fishing, but also a scientific principle can be read to the civilization of the product, to learn scientific from culture, students are not only learning about the cultural transmission of early Indigenous wisdom, but also complementing existing scientific knowledge in formal textbooks, with low student learning load, student-centered learning, the use of real tatala in museums, and Multimedia interactive learning, students in a variety of interactive learning environment, and then build up their own ability . It is expected that students will be able to explore the wisdom of the ancestors from different perspectives when promoting indigenous culture.

Keywords: situated teaching, tatala, indigenous wisdom, multimedia

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原住民學童接受文化融入自然與生活科技教學之研究

高慧蓮¹ 張祈良²

摘要

本研究目的主要探討原住民學童接受文化融入自然與生活科技教學後，學習興趣的改變。以「協同行動研究法」(Collaborative Action Research)的研究理念及做法，邀請排灣族學校的平地與原住民教師參與研究，國小學童為研究對象，藉由學生的起點行為與教材分析，排灣族科學智慧之整理與轉化、文獻探討等，開發、設計以排灣族文化為基礎的文化融入自然與生活科技教學多元化教材模組，並加強對於計畫內原住民學童科學素養的培養。本計畫發展出以排灣族文化為基礎之文化回應科學教學模式(CRSTM)的「火的利用」、「水資源」、「天文」、「簡單機械」等教學模組。

研究應用所發展出來的文化回應科學教學模式(CRSTM)之教學模組於實際教學情境中，以探索本研究所開發的教學模組之品質及有用性，並進行推廣研究至其他的學校，目前研究持續進行中。

關鍵詞：文化回應教學、協同行動研究法、排灣族文化中的科學

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A Study Research for Indigence Students Receiving Culture into the Teaching of Science and Technology

Huey-Lien Kao¹ Chi-Liang Chang²

Abstract

The main purpose of this study is indigence students receiving science and cultural integration of science interest changes. The study will adopt collaborative action research and invite Paiwan grand old men and teachers to participate in the study. The subjects will be elementary school students.

Research team members continued to invite Paiwan family elderly, as well as Han and indigenous school teachers to participate in the research based on “collaborative action research method”. The investigators continued to analyse students’ starting behavior and textbook, as well as arrange and transforme scientific wisdom of Paiwan, and review literatures etc., to design Paiwan culture-based teaching modules in order to strengthen scientific literacy for indigenous students.

The research team recruited indigenous people to participate in teacher training for indigenous science education. Therefore, the research team thought how to conduct indigenous science education when in cooperation with the tribes? Taking into account that the tribes who are not educators, the research method shifted to ethnographic research. Then, the investigators developed “Uses of Fire”, “Water Resources”, “Astronomy”, and “Simple Machines” teaching modules based on Paiwan culture and Cultural Responsive Science Teaching Model (CRSTM). In addition, the investigators made e-books of the above modules and put them on the digital learning platform.

The study applied the modules based on CRSTM in actual teaching situation to explore the quality and usefulness of these modules. The study promotes this study to Rukai schools and now is in progress.

Keywords: culturally responsive teaching, collaborative action research, Science in Paiwan culture

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原住民學童數位 CPS 面積與體積五感課程發展與建置之研究

簡靖樺¹ 黃思華²

摘要

提升偏遠地區學生的學習是近幾年教育政策的重點。原住民學生的學習狀況自政府開始積極推動文化保存政策後，便成為重要的教育議題，尤其以原住民學生數學學習成效不佳的原因更是備受關注。本研究以宜蘭縣南澳國小五年級學生為對象，透過協作式問題解決模式（Collaborative Problem Solving, CPS）結合五感（視覺、味覺、嗅覺、觸覺、聽覺）體驗，發展一套面積與體積課程，結合資訊科技的引導及教學並安排實際動手做的探索加強數學抽象概念。研究結果發現：CPS五感學習課程可以提升原住民學童面積與體積概念，學生在學習過程中透過與文化相關的動畫引導，能提升學生學習動機與學習認同感。學生學習成就與學童之先備知識、數學學習策略、幾何核心概念呈現正相關；與數學焦慮呈現負相關。本研究結果亦發現，教師指導原住民幾何思考層次較高的學童，教師需確認學習者的先備知識，幫助學生發展學習策略；指導幾何層次思考層次較低的學童，首先需創造一個友善的學習環境，瞭解學生學習特質，以減輕學童的數學焦慮達到學習效果。

關鍵詞：原住民學童、數學、幾何思考層次

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The Establishment and Development of Aboriginal Students' CPS and Five Senses in Digital Area and Volume Classes

Ching-Hua Chien¹ Tzu-Hua Huang²

Abstract

Promotion remote school student's learning is the important education policy in recent years. Since government started to implement culture preservation policy, the learning situations about the aboriginal students are paying more attention in education issues especially in the result of mathematical problems. In this study, we conduct a series of area and volume math courses through collaborative problem solving (CPS) Teaching Mode and experience the five senses (sight, taste, touch, smell, hearing) targeting on aboriginal students. The purpose is to implement aboriginal students' preferable learning styles in learning mathematical concepts, to design hands-on activities and to adopt technological instructions in learning process. The research finds that CPS teaching mode can promote student's concept of area and volume. Through play culture-related animation that also can promote students learning motivation and recognition. Student learning achievement among aboriginal students was significantly correlated with prior knowledge, mathematics strategy, and the core concepts of geometry; however, geometric learning achievement was negatively correlated with math anxiety. Our research also finds that teacher teach the student who with higher geometric consideration hierarchy need to confirm their prior knowledge to help them develop learning strategy. The opposite of teaching lower geometric consideration hierarchy students that teacher need to create a friendly learning environment and understand student's learning characteristic so that teacher can release student's learning anxiety.

Keywords: aboriginal student, mathematic, geometric consideration hierarchy

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幼兒園實施布農族文化適性教學之行動研究

朱惠慧¹ 陳淑芳²

摘要

本研究旨在探討結合適性教學理念與文化回應教學模式於幼兒園實施的歷程、了解布農族幼兒於文化回應適性課程中的學習反應與改變，及解析一位漢人教師運用文化回應適性教學理念實施文化回應教學之專業成長。研究場域為東部地區一所國小附設幼兒園，3-5歲布農族幼兒共15位參與，採取行動研究法。研究結果包含以布農族狩獵文化為核心的文化回應適性課程—「獵人與狗」、幼兒的學習反應與改變，以及教師的專業成長。研究發現教師運用部落特色及資源，並依據幼兒的興趣、能力，擬定教學目標，並將教學延伸至部落，讓幼兒有機會接觸自身的傳統文化資產，瞭解祖先的山林生活經驗及智慧，進而接納、認同與欣賞族群文化，過程中提升了幼兒的口語發表能力及自信心。教師也提昇自己的課程意識、實務知識與教學實踐力，得以建構出提升布農族群幼兒學習表現的文化回應適性課程。

關鍵詞：布農狩獵文化、文化回應教學、幼兒適性教學

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Culturally and Developmentally Appropriate Practice for Bunun Kids

Hui-Hui Zhu¹ Shu-Fang Chen²

Abstract

Hunting culture exists in the children's real life experience, in school they occasionally humming Bunun songs, telling the stories about their family hunting. In order to combine culture and science education in the kindergarten, the teacher designed a teaching activity about hunting, called "Hunter and Dog", and integrated the new curriculum with the children's parent culture by the methods of culturally responsive adaptive teaching. The aim of the research was to investigate the practice of adaptive teaching and culturally responsive teaching in the kindergarten, and learning react and change from the Bunun children, and the Han teacher's professional growth as well. The study was undertaken in a class of mixed age of a public kindergarten in eastern Taiwan. Data and interview were collected, sorted, and analyzed with the method of action research.

"Hunter and Dog" used culturally responsive adaptive teaching, and integrated the tribal traditional ecological wisdom, life and hunting culture into science education. Collected Family and tribes' traditional wisdom, life experience, and tribal cultural through the children's worksheets, and transformed the resources into the materials of school science education. So the children learn the value of scientific knowledge in their own ethnic culture, and proud of their own culture. The study demonstrates that:

1. Integrate the students' parent culture and the tribal resources into the teaching, also build Bunun cultural science knowledge by actual hands-on practice, cooperative learning, investigation, visits, interviews, discussions and other ways, will help the young children to understand their own ethnic culture, and enhances their awareness of the environment and the concept of sustainable development, and the expanse their learning experience. The teacher also cooperates with local cultural institutions, parents and children, schools, primary school students to collect tribal culture resources, Also, based on the child's interest and ability, the teacher, parents and students together set up teaching objectives and learning plan in the curriculum. Therefore, the curriculum become more diverse and rich, which not only bring the tribal resources into the classroom, but also extend teaching into the tribe. The Han teachers can quickly understand the Bunun culture and the school, which reduce the pressure on teachers in new school. For kindergartens, the tribal resources play a support role in teaching, and established the relationship between kindergarten and tribe.
2. Through practice of school curriculum, children have the opportunity to learn their traditional cultural, understand the ancestral experience and wisdom of the mountain life, and then accept, identify and appreciate their own ethnic culture. The children improve their oral expression and self-confidence in the learning the process as well.
3. Through self-awareness, dialogue-reflection and the support from experts and scholars, the teacher will clarify his/her own view of multicultural education. In the process of action research, he/she gradually practice culturally responsive adaptive teaching, and then enhances his/her own curriculum awareness and practical knowledge. Combined the action research with teachers' professional knowledge and practical ability, we can construct a

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curriculum to improve the performance of Bunun children.

Keywords: Bunun hunting culture, culturally responsive teaching, DAP

叁、海報論文摘要 Posters Abstract

提昇排灣族學童數理競爭力與科普活動之研究

高慧蓮¹ 陸怡琮² 施焜耀³ 李馨慈⁴ 林志隆⁵

摘要

本研究計畫這幾年的研究亮點，是讓原住民學校教師暨原住民籍國小教師科學教育專業再升級！例如原住民音樂教師、文化教師接受科學教育的碩士班課程後，都已經能夠隨時掌握文化中的科學。研究團隊計畫成員持續以「協同行動研究法」(Collaborative Action Research)的研究理念及做法，邀請排灣族耆老、平地與原住民學校教師參與研究，以國小學童為研究對象，藉由學生的起點行為與教材分析，排灣族科學智慧之整理與轉化、文獻探討等，開發、設計以排灣族文化為基礎的教學活動及多元化教材模組，並加強對於計畫內原住民學童科學素養的培養。

提昇原住民學童科學閱讀能力之研究，主要目標在提升排灣族學生科學閱讀能力。在完成測評工具的發展和教材與教學模組的開發後，計畫的目標以在教學現場測試閱讀教材與教學模組的妥適性，並針對所遭遇的問題進行修正，且開始將修訂完成的閱讀教材發展為電子書。

而奈米科技新知研究計畫目標主要是以科普活動提昇原住民認識奈米科技新知。計畫中將奈米科技知識自學術機構、學校、專業領域向下紮根普及於原住民中小學教育，讓原住民中小學師生有機會接受奈米科技知識，動手做實驗並參與相關研究，也藉由閱讀教材之開發、教師增能進修之機制與課程規劃深根原住民教師有關奈米科技新知內涵。而數位學習平台的建置與推廣也將提昇原住民認識奈米科技新知。

研究團隊招募原住民部落人士共同參與原住民科學教育師資培訓的進行。本計畫並發展出以排灣族文化為基礎之文化回應科學教學模式(CRSTM)與科學閱讀及奈米科技新知等教學模組，並且製作成電子書置於數位學習平台上。

關鍵詞：文化回應科學教學、科學閱讀、奈米科技新知、數位學習

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A Study for enhance students mathematical Paiwan competitiveness and science activities

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Abstract

Research highlights of the study in recent years are to allow aboriginal school teachers and aboriginal teachers in elementary schools upgrade their professional growth on science education! For example, indigenous music teachers and cultural teachers have been able to master science in cultures after receiving the science education master's program.

Research team members continued to invite Paiwan and Rukai family elderly, as well as Han and indigenous school teachers to participate in the research based on “collaborative action research method”. The investigators continued to analyse students’ starting behavior and textbook, as well as arrange and transforme scientific wisdom of Paiwan and Rukai, and review literatures etc., to design Paiwan and Rukai culture-based teaching modules in order to strengthen scientific literacy for indigenous students.

The purpose of this study is to develop a culture responsive science reading program for fifth- and sixth-grade students of Paiwan Tribe. We developed a set of tests of reading component ability for monitoring the students’ progress, a series of science texts based on Paiwan culture, and a culture responsive science reading instruction.

The main purpose of this study is to enhancing indigence awareness in nanotechnology with the popular science activities. In this study, we will transmit nanotechnology knowledge from academic institutions to Indigence primary and junior high schools, so the indigence primary and junior high school teachers and students have the opportunity to accept the knowledge of nanotechnology, hands on experiments. This study investigated the indigenous schools recognize nanotechnology new knowledge.

The research team recruited indigenous people to participate in teacher training for indigenous science education. Therefore, the research team thought how to conduct indigenous science education when in cooperation with the tribes? Then, the investigators developed teaching modules based on Paiwan culture and Cultural Responsive Science Teaching Model (CRSTM). In addition, the investigators made e-books of the above modules and put them on the digital learning platform.

Keywords: culturally responsive science teaching, science reading; nanotechnology, e-learning

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數學部落教室中的原民族文化數學教材發展

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摘要

「數學部落教室」以發展原民族文化數學教材為重點，並從中探究與理解部落中的國小學童之數學學習情形，期待能為部落學童營造更為合宜與友善的數學學習環境，同時提升部落學童的數學學習品質。研究的進行係以「原民族文化數學教材的設計與實踐」為主要脈絡，共經歷了「準備與規劃」、「探尋與理解」、「設計與溝通」、以及「實踐與反省」等四個重要階段。透過「新創」與「轉化」兩種不同的教材發展路徑，三年來「新創」的原民族文化數學教材共計有十套，另有「轉化」版原民族文化數學教材五套。藉由各套教材的實踐，透過觀察、晤談以及相關文件的蒐集與分析，本研究嘗試理解與整理部落學童數學概念的學習情形，同時亦探尋部落學童對於透過原民族文化數學教材學習數學的相關回應。研究發現：原民族文化數學教材的實踐對於部落學童數學概念的建構與學習是有助益的，且部落學童對於透過原民族文化數學教材學習數學亦多是呈現正向的反應。

關鍵詞：原民族文化、國小、數學教材

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Math Classroom in the Tribe— Development of culture-based mathematics instructional modules

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Abstract

The main purpose of the “Math Classroom in the Tribe” is to develop culture-based mathematics instructional modules for indigenous students of elementary schools, then to investigate indigenous students’ math learning through the process of modules teaching. It is expected that such development of culture-based mathematics instructional modules could create friendly and appropriate math learning environments for indigenous students, and will lead to improvement in the mathematics learning environments for the tribes. Based on four stages of guidance, including “preparation and planning”, “exploration and understanding”, “design and communication”, and “practice and reflection”, the “Math Classroom in the Tribe” developed fifteen sets of culture-based math instructional modules in total, including “create-new” and “revise-old” two approaches. Through observation, interviews, questionnaires, and related documents, the research findings revealed that most indigenous students enjoyed the learning activities provided by the mathematics instructional modules, and were interested in learning mathematics.

Key words: indigenous culture, elementary schools, mathematics instructional modules

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原住民學童的幾何概念理解

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摘要

原住民的生活中充滿豐富的幾何圖騰，但是學術文獻卻經常顯示原住民學童的數學表現不佳，原住民學生數學低成就的現象似乎普遍存在，也是教育現場的老師面臨與關心的議題。然而，新課綱強調數學的教學應與學生的生活結合而做延伸，是故本研究以數學主題裡和原住民學生的生活、文化息息相關的幾何概念為主，探討原住民學童的幾何概念理解是如何在小學階段發展。

本研究採「吳-薛國小學童van Hiele幾何測驗」為研究工具，研究對象為台灣東部小一到小六原住民學童共210名學生，所得結果和台灣中部686學童比較。本文只分析層次一的結果，題目共25題選擇題，題目包含三種圖形：三角形、四邊形、圓形，施測時間為40分鐘。層次一的分析結果顯示，東部學童於三角形和圓形的通過率優於中部學童，達顯著差異。然而四邊形的通過率則是中部學童表現較優，達顯著差異。本研究結果和一般的文獻認為原住民學童的數學普遍低落的現象是不同的，是否可以推論到其他地區值得後續研究。東部學童的幾何概念理解表現較優異與落後的原因將於本文探討和提出相關建議。

關鍵詞：van Hiele 幾何概念、原住民學童、數學低成就

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The Conceptual Understanding of Geometry of Indigenous Children

Hsiu-Fei Lee¹

Abstract

Indigenous life is full of geometric shapes or totem. However, the references show that indigenous children are mathematically underachieved. Such issue is also what the teachers often encounter and concern about. The new course guidelines emphasize that the teaching and learning should be linked with students' life and extend from that. Therefore, this study chose a mathematical topic strongly related to indigenous students' life; that is, geometry as the topic for research to understand how indigenous children's conceptual understanding of geometry develops in the elementary level.

This study adopted 'Wu-Shuei Elementary Children's Geometry Test' as the tool. The subjects were 210 indigenous children from grade 1 to 6 in East Taiwan. The results would be compared to 686 children from Central part of Taiwan. Only the results from Level I were analyzed for this paper, which contained 25 multiple choice questions. Three kinds of geometric shapes were included in the questions, which were triangle, quadrilateral, and circle. The testing time was 40 minutes.

The results of Level I showed that the eastern part of children outperformed their peers on triangle and circle. The differences were statistically significant. On the other hand, the performance on quadrilateral was reverse. The central part of children significantly outperformed their peers in East Taiwan. Such results were different from what the references suggest that indigenous children's mathematical low achievement was prevalent. Whether the results found in this study can be applied to other areas worth of further research. The reasons why the east part of children performed better or worse than their peers would be discussed, and related suggestions would also be proposed.

Keywords: van Hiele geometry concept, indigenous children, mathematics low achievement

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國民小學學生參與非制式化科學教育活動營之研究

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摘要

本研究主要目的為探究非制式化科學教育活動對學生的學習興趣及其學習成效之影響。非制式化科學教育活動的內容主要是以文化本位為主體，將原住民族文化背景編入自然、數理與生活科技等科學知識體系，進而設計出以原住民族文化為內涵的科學教育活動營。

目前已發展完成排灣族、阿美族、布農族、雅美族、魯凱族等五個族群科學課程教案，在這些原住民族重點國民小學辦理「原住民族非制式科學教育活動營」，此營隊連結該校老師與部落人士共同授課，以三至六年級學童為研究對象，本研究從104年8月4日至105年6月28日在不同學校進行了20場次的原住民族非制式化科學教育活動營，共769位學童參與。

本研究對於學生實施情境興趣、科學探究能力及學習成效前後測分析，以t考驗進行分析發現學生情境興趣、科學探究能力及學習成效後測均有顯著差異，顯然學生在情境興趣、科學探究及學習成效上有很明顯提升。阿美族學校6所共有246位學生，最喜愛的單元為「大海與我」；排灣族5所學校共有210位學生，最喜愛的單元為「排灣族傳統食物」；布農族8所學校共有286位學生，最喜愛的單元為「超級獵人」；雅美(達悟)族1所學校共有27位學生，最喜愛的單元為「舟船文化」。

本研究經統計分析結論發現：在活動教學上考量學生的文化背景與學習型態，以學生的母文化作為學習的橋樑，可以使學生在活動中追求卓越的表現。結合原住民族文化內容以及設計導向活動的科學營模式，貼近學生生活經驗可促進其科學學習興趣及探究能力，同時提升他們在科學之學習成效。

關鍵詞：原住民族、科學教育、學習興趣、學習成效

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The Study of Elementary Schools Students Join the Science Education Camp

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Abstract

The purpose of this study is to explore the impact of non-formal science education activities on students' learning interests and learning outcomes. The non-formal science education activities is composed of culture-based contents, taking indigenous cultural background and incorporate into life science, mathematics, technology. These activities are then used designed a Indigenous cultural-oriented science education camp.

At the present time, we have developed science curriculum for five Indigenous groups, including the Paiwan, Amis, Bunun, Yami, Rukai, and hosted more than 20 Indigenous cultural-oriented science education camp in Indigenous elementary schools for 3rd to 6th grade students. Between August 4th, 2015 and June 28th, 2016 we have had 769 students participating in the camp.

We analyzed students' situational interest, scientific inquiry ability and learning efficacy before and after the test using t test. The result showed that students' situation interest, scientific inquiry ability and learning efficacy were significantly improved. The 246 students from the 6 Amis schools showed most preference for the unit, "the Sea and Me"; the 210 students from the 5 Paiwan schools liked the unit "Paiwan Triditional Food"; the 286 students from Paiwan schools like the "Super Hunter" unit the most, and the 27 students from the one Yami (Tao) school like the unit, "Canoe Culture" the most.

The results of statistical analysis show that when taking students' cultural background and learning pattern into consideration during the teaching activity, and using students' mother culture as the bridge of learning, we can make students work harder in their activities. Combining the indigenous cultures content and the science camp model allowed students to reflect their life experiences during the learning process and promote their scientific interest in learning and exploring ability, and enhanced their scientific learning outcomes.

Keywords: indigenous peoples, science education, learning interest, learning outcomes

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原住民學校奈米科技新知電子書之研究-動物中的奈米

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摘要

本研究探討原住民學校認識奈米科技新知-動物中的奈米，以生動活潑、深入淺出的內容介紹奈米科技新知-生物磁性粒子。過程中使用奈米科技教材編輯電子書軟體，藉由「奈米育樂營」方式進行，推廣奈米科技新知。透過原住民學校參與「認識奈米科技新知育樂營」實驗教學，配合建構數位學習系統，體驗奈米科技學習e化的教學活動，以提昇屏東地區原住民學童對奈米科技的學習興趣，並且希望藉由活動之推廣，落實屏東地區原住民學童對於奈米科技的認知。

研究者利用原住民部落地區實地考察、奈米科技學習成效比較檢測題、奈米科技新知非正式晤談原住民學生等資料收集。藉由研究團隊與屏東縣排灣族原住民國民小學安排協調，透過電子書教材，使原住民學童從「認識奈米科技」到「應用奈米科技」之實施，具體提昇屏東地區原住民學童認識奈米科技。

關鍵詞：奈米科技新知、電子書、生物磁性粒子

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A Study of Indigence Schools in Nanotechnology with E-Books - Nano in Animals

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Abstract

In this study, the nanotechnology awareness in indigence schools with e-books – Nano in animals. A lively, easy to understand concepts of the Nanotechnology - magnetic nanoparticles applications were introduced to the students. E-Book software was used to edit the teaching materials of nanotechnology. The Nanotechnology teaching materials and “nanotechnology camp” to promote the knowledge of nanotechnology for the students. We also construct the digital learning system. The e-learning experience of nanotechnology teaching activities enhanced the aboriginal students in Pingtung interest in learning and improved indigence students for nanotechnology awareness.

The researchers used fieldwork in indigence areas, learning achievement test of nanotechnology, informal interviews to collect the data for the indigence students. The cooperation between research team and Paiwan indigence elementary school in Pingtung, through the e-book teaching materials, make indigence students from the “understanding Nanotechnology” to implement the “application of nanotechnology” and enhance the interested in learning nanotechnology.

Keywords: nanotechnology, e-Book, magnetic nanoparticles

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展與應用數位學習系統縮短原住民數學學習落差之研究

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摘要

本計畫旨在縮短原住民學童的數學學習落差，而本子計畫之主要任務有兩個。一是協助總計畫建置原住民師生專用的數位學習平台。二是設計以原住民文化融入的數學電子教科書。期盼藉由電子書的文化與多媒體元素並結合數位學習平台的功能來提升原住民學童學習數學的動機與興趣，進而達到縮短原住民學童數學學習落差之目的。

本計畫主要在探討原住民國小學童運用數位學習平台與電子書進行數學學習之成效。本研究第三年為移轉階段，將數位學習平台上線使用，持續修正系統與精緻化教學模組，並進行教育訓練、實驗教學及師資培育。

本計畫亦架設了提升排灣族學童數理競爭力與科普活動之研究網站供總計畫與其他子計畫使用。為了順應人手一台行動載具的資訊時代潮流，本子計畫所發展的網站與數位學習平台將以支援多元與跨平台的資訊產品為設計理念，讓使用者能在電腦、平板或手機，Android或Mac之不同系統上瀏覽與學習。網址為 <http://paiwan.nptu.edu.tw/Paiwan/index.aspx>。

關鍵詞：數位學習、行動載具、電子書、數位學習平台

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Study on Developing and Applying Digital Learning System to Shorten the Mathematical Learning Gap in Aboriginal Students

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Kun-Yauh Shih⁵ Shing-Tsz Lee⁶

Abstract

The program aims to shorten the mathematical learning gap in aboriginal students, and the primary tasks of the sub-program are two-fold. The first task is to assist the master program to build a digital learning platform for aboriginal teachers and students. The second task is to design electronic mathematical textbooks with characteristics of aboriginal culture. It is expected that aboriginal students' motivation and interest in learning mathematics can be enhanced through the culture of e-books, multimedia elements and digital learning platform, thereby attaining the objective of shortening the mathematical learning gap in aboriginal students.

This program is designed to explore the effectiveness of using digital learning platform and e-books to learn mathematics by the aboriginal primary school students. The third year of this study is a transfer stage, where the digital learning platform will be put into on-line use. This study will continuously correct system and refine teaching modules, and conduct education and training experimental teaching and teacher training.

This study also sets up a research website regarding improving the mathematical competitiveness and activities to popularize science of Paiwan students for the use of the master program and other sub-programs. In order to adapt to the information age when everyone carries one mobile device, the website and digital learning platform developed by this sub-program will take supporting diverse and multi-platform information products as the design concept, hence allowing users to browse and learn on computers, tablets or mobile phones, or different systems of Android or Mac. The website is <http://paiwan.nptu.edu.tw/Paiwan/index.aspx>.

Keywords: digital learning, mobile devices, e-books, digital learning platform

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走活傳統-從數學語意出發的民族數學

楊晉民¹ 魏士軒² 陳嘉皇³

摘要

面對孩童數學學習上的困難，藉由推動大學協助偏鄉地區國民中小學發展課程及教學計畫，透過研習、對話、分享及諮詢等方式，我們發現在「教材與教法」上，教師應順應原住民地區的特殊性，培養本身轉化教材的能力，並將教材與當地生活與文化結合，重視知識與學童生活經驗的連結。教師與課程的內在互動，融合學童熟悉的經驗和文化，往往是有效數學教學之重要關鍵（徐偉民、楊雅竹，2009）。因此，教師必須要能瞭解原住民文化才能提升數學教學的成效。

在一年級的數學課本當中涉及的數學概念，都可以將泰雅元素套入，但在二年級的數學概念裡，泰雅元素融入的頻率逐漸減少，且難度越來越大。我們重新思索數學題目泰雅化的方向是否正確？是否真的可以提升學童的學習興趣，並達到學習的目標？幾經思量後，定調「將學童應該明白的數學語意，透過泰雅邏輯思考，達成學習的目標」為宗旨，因此本研究於104學年度與台中市和平區博屋瑪民族小學教師合作，從數學語意著手積極的創發民族數學教材，具體做法：

- 一、從一年級數學課本中，提取學童應該了解的數學語意，例如分(divide)、等於(equal)、部分(part)、全部(whole)、塊(piece)、較大(bigger)、較小(smaller)、一半(half)、有(with)、沒有(without)、相同(same)、短(short)、長(long)、加(add)、減(subtract).....等，計有 65 個。
- 二、透過族語教師轉譯，從文化及語言中尋找有無互相契合的詞彙、作法或生活經驗，強化數學與文化的連結，力求符應學童的生活並提升學習動機與興趣。
- 三、分配數學語意給教學現場的老師們，依自身對原民文化的解讀，融入泰雅元素重新詮釋並創發數學示例。
- 四、透過每一次的教師進修研習活動，將數學示例逐題審題並討論修正，以符應學生需求和課程目標。

經一學年不斷的修正與分析，不僅將示例產出，在潛移默化下，學校老師的數學涵養亦有所提升。雖然進度較慢，只有完成一年級的數學示例，但有了經驗的啟發，相信在教學團隊的努力下，能逐步完成「課程泰雅化」的目標。

關鍵詞：民族數學、數學語意、教學示例、泰雅族

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Vitalization of Tradition— Ethnomathematics Based on Mathematical Semantics

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Abstract

We worked with local colleges and universities in the formulation and execution of curriculum programs for primary and middle schools in remote areas across Taiwan in order to address challenges facing indigenous children in their mathematics learning. Through dialogue, sharing, and consultation, we have discovered that instructional methods play a pivotal role in learning performance. Specifically, teachers must transform learning materials to highlight the relevance of target concepts within the unique context of aboriginal cultures. The role of the teacher cannot be overemphasized. Only when a teacher holds a deep understanding of the culture indigenous to her/his teaching post, and is capable of designing teaching activities in line with the experiences and needs of their students, can she/he successfully impart conceptual mathematical knowledge (Hsu & Yang, 2009).

All of the target concepts for first-graders can be easily instantiated with examples relevant to Atayal culture. These are presented in the textbooks. However, in these textbooks Atayal elements decrease remarkably in textbooks for second grade and higher. This prompted us to ponder if the Atayalized approach to mathematics learning is appropriate, and if so, can this approach effectively increase student interest and performance? After careful consideration, we set our aim: “to impart mathematical semantics via Atayal-based logic to help Atayal children grasp the basics of mathematics”. This study worked with Pu'ma Elementary School (Taichung City) in the academic year 2015 to develop ethnomathematics-based learning materials.

1. We extracted the primary mathematical semantics from the Grade 1 mathematics textbook, including concepts such as division, equal, a part or the whole, piece, comparison of size and length, half, with or without, sameness, addition and subtraction. We found a total of 65 types of ideas.
2. Through an interpreter of the tribal language, we attempted to locate corresponding phrases, methods or life experience to create a connection between the mathematics concepts and the students' culture. This was intended to enhance indigenous children's motivation and interest in learning.
3. By distributing mathematical semantics ideas among teachers, we encouraged the teachers to integrate Atayal elements into examples given in class based upon their understanding and interpretation of the indigenous culture.
4. We engaged in discussions on every math example in teachers' workshops since the program began, with an aim to better satisfy students' needs and achieve curriculum goals.

After a year of analysis and revision, we have produced a set of standard examples and found that the training workshops have had a positive effect on teachers' capabilities. These results provide evidence that the Atayalization of the mathematics curriculum is an achievable

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and valuable goal.

Keywords: ethnomathematics, mathematical semantics, instances

民族數學師資培育與專業發展

魏士軒¹ 楊晉民² 陳嘉皇³

摘要

面對孩童數學學習上的困難，藉由推動大學協助偏鄉地區國民中小學發展課程及教學計畫，透過研習、對話、分享及諮詢等方式，我們發現在「教材與教法」上，教師應順應原住民地區的特殊性，培養本身轉化教材的能力，並將教材與當地生活結合，重視知識與學童生活經驗的連結。除此之外，「教師」也是一個重要的關鍵，教師必須要能瞭解原住民文化，教師與課程的內在互動，融合學童熟悉的經驗和文化，往往是重要的關鍵（徐偉民、楊雅竹，2009）。

本研究於104學年度與台中市和平區博屋瑪民族小學合作，從數學語意著手積極的創發民族數學教材，應用陳嘉皇(2015)發展之「課程資源之進展機制」模式：從解碼、釐清、處理、設計、執行等機制培育教師課程設計與教學實施能力。

要激發教師運用課程資源，在起始點提供「解碼」的機制，引發其運用課程資源的動機。此機制包含其教學歷程所遇困難之相關課程內容、教科書的情境、與教師教學經驗衝突之事項、學生學習議題產生之認知困境，這些現象皆須教師思考如何解決，因此可協助相關的課程資源，引導及協助教師進行問題之釐清和解決；在「釐清」和「處理」階段，在教學的前、中、後期進行閱讀、評量及調整課程等策略。教師課程資源的運用可針對數學單元目標、能力指標、教科書及教學指引的分析與學生學習步驟和教材編排等加以「釐清」，以瞭解學習數學單元的目標、教材特質和學生概念發展之間的關係。再者，針對選擇的課程資源和作業的順序加以「處理」，提供有力的學習結果和更好的軌道解釋。「設計」的機制，則是教師運用課程資源去設計「合宜的學習作業」，促進學生學習的機會，這些合宜的學習作業設計包含活動及作業內容、學習的策略和方法、作業操作技術的說明和引導程序、學生學習表現如何記錄與分享；最後教師將調整後的課程資源進行教學實驗，以瞭解教材設計和學生學習成效之間的關係。透過此模式的進展，教師組織學科內容並描述學生朝向更聰慧知識的有力途徑，明確的區分學生建構一種統整知識架構所需概念之間的連結，連結內容至學生可以解釋之合適的現象或模式，提供有效的教學策略和學習作業以協助原住民學生從低層次轉移至高層次的認知發展，教師並從「做中學」，建構屬於泰雅族的數學課程，並朝著「立足部落、涵育傳統、雙軌多元、走向國際」的全人泰雅教育願景邁進。

關鍵詞：民族數學、專業發展、師資培育

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Teacher Cultivation and Professional Development: A Case Study of Ethnomathematics

Shih-Hsuan Wei¹ Jinn-Min Yang² Chia-Huang Chen³

Abstract

We have worked with local colleges and universities in formulating and executing curriculum programs for primary and middle schools in remote areas across Taiwan the previous academic year, in order to address a common challenge facing indigenous children when they tried to learn the basics of mathematics. Through various ways such as learning, dialogue, sharing, and consultation, we have discovered that instructional methods play a pivotal part in their learning performance. Specifically speaking, teachers should first grasp the uniqueness of aboriginal cultures, and then figure out ways to transform learning materials into something that is more familiar and comprehensible to indigenous children. On top of this, the role of a teacher cannot be overemphasized. Only when a teacher understands the indigenous culture where she/he holds a teaching post, and designs a series of teaching activities which are more in line with these kids' experience and needs can she/he impart conceptual mathematical knowledge (Hsu & Yang, 2009) to pupils.

The present study joined efforts with Pu'ma Elementary School (Taichung City) in the academic year 2015, aiming to develop ethnomathematics-based learning materials with the guidelines presented by Chen in 2015. This system is aimed to help teachers keep track of the distribution of curriculum resources and develop effective ways on curriculum design and classroom surveillance through decoding, clarifying, handling, designing, and execution. At the inception, "decoding" functions as an incentive for teachers to better employ curriculum resources and ruminate the more difficult parts of the curriculum content, any conflicts existing between textbooks and teachers' classroom experience, and the cognitive dilemma facing students. All this requires a teacher's dedication to come up with solutions. Therefore the next two steps are "clarification" and "handling of the situation". During these two phases, we took strategies regarding reading, evaluation, and curriculum adjustment, while teachers clarify the following matters: the specific goal of each and every unit, capability indicators of students, analyses of textbook content and teaching guidelines, and learning steps for students and the design of instructional materials. By so doing, this study pinpoints the relationship of a unit's goal, the attributes of teaching materials, and students' conceptual development. Furthermore, a teacher needs to handle the curriculum resources and the sequence of assignments, so as to provide students with better instruction and explanations about the rationale of mathematics. "Design" refers to the process in which a teacher employs curriculum resources to design "appropriate assignments" for students to have optimal opportunities for learning. The appropriate assignments consist of classroom activities and assignment content, learning strategies and methods, tips about operational techniques and introductory procedures, how to take note of students' learning performance and share with others. Lastly a teacher is to conduct an instructional experiment upon the adjusted curriculum resources, so as to reveal the correlation between the design of instructional materials and the learning performance of

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students. This model provides a teacher with a more systematic approach in organizing curriculum content and resources and imparting knowledge to students. By discriminating students into several groups and establishing a structure of knowledge, this model is deemed a success because it is renowned for effective teaching strategies and assignments for students, and it was obvious that indigenous students have been more able to learn about mathematics in their own pace and make progress in their numerical cognition. On the other hand, teachers may learn from doing and create a math curriculum for the Atayal, ultimately fulfilling the vision of “holistic education” that boasts heritage, tradition, bilingual education and cultural diversity, and a global outlook.

Keywords: ethnomathematics, professional development, teacher cultivation

南排灣族數位文化融入式健體實驗課程－健康體位知識成效研究

華國媛 (阿莫伊·蘿夏蓆)¹ 王凱倫 (蕭法里昂·基優)²

摘要

本研究旨在以準實驗研究法來探究排灣族國小學童在介入式課程之後，健康知識、態度以及行為上的改變。計畫透過自創的跨文化科學教材開發的新工法「平行鷹架模組式課程開發工法」(Framework, Module, Parallel, FMP for culturally inclusive curriculum)成功開發出了南排灣族國小五年級文化融入式健康與醫療科學實驗課程。課程內容乃結合教育部九年一貫制健體課程內容大綱與在地文化脈絡為主要內容。為求教學的即時性與共備性，以及教材的可重複性，本研究使用數位科技將教材、評量、教學活動整合為連續性網路平台教與學的數位教室。本實驗課程以一學期為期八週之期程進行試教，課程前施於前測，完成課程後施於後測。資料分析工具乃以SPSS 10.0版本作前後測成對樣t檢定。研究結果表示南排灣國小五年級實驗組學生前後測成績比較在健康體位態度與知識上都呈正向顯著至非常顯著的成績表現。相較於控制組的成績表現，實驗組學生總體成績進步程度較控制組明顯良好。

關鍵字：南排灣族、平行鷹架模組式課程開發工法、台灣原住民族、健康體位知識

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The Effectiveness of Cultural Inclusive Health Education Pedagogy for Taiwan Indigenous-the Outcome of Learning Healthy Knowledge in *Paiwan* Tribe Elementary Students

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Abstract

The main purpose of our research is to investigate the outcome and impact of the Taiwan Indigenous Culture Inclusive Health Science Education Program for the southern 5th grade elementary *Paiwan* tribe students. The materials of course which were established into e-platform were composited by FMP (Framework, Module, Parallel, FMP). The curriculum lasted four months in the semester, and examined the performance of learning by pre-test and post-test. After that, the scale from the testes were analyzed by SPSS for Windows 10.0 version and t-test analyses were performed. The results are as follows:

1. There are significant differences between the two groups in knowledge learning and enhancing it illustrated the curriculum was effective in improving southern *Paiwan* 5th grade elementary students in learning health science knowledges (control group= $p > 0.05$; experimental group= $p = 0.001$).
- 2) The results show that good program in learning healthy knowledge between pre- and post- testes in southern *Paiwan* experimental group students ($t = 6.231$; $p = 0.001$), and also indicated that curriculum is suitable for southern *Paiwan* 5th grade elementary students.

Keywords: Taiwan indigenous, healthy knowledge, FMP, southern *Paiwan* tribe

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肆、教材摘要 Teaching Materials Abstract

數位教材—映射與堆疊

趙貞怡¹ 黃意涵² 高筱綺³

摘要

本研究計畫「原住民學童CPS空間概念課程與評量之教學平台發展與建置研究」以原住民國小高年級學童為對象，進行「映射」與「堆疊」等概念的數位教材研發，讓教師及學童藉由互動式數位教材的輔助，融入數學課程教學並提供學生自我學習之用。並運用「協作式問題解決」(Collaborative Problem Solving, 以下簡稱CPS)策略進行教學。

學生除了需接受CPS空間概念互動式數位教材「映射」與「堆疊」課程活動外，課前課後也各進行1次的空間能力生活化題組式評量，以評估該教材之教學成效，以及教材設計的適切性。

本互動教材以FLASH動畫設計而成，內容分述如下：

- 一、映射單元：目前有「彩色方塊映射」、「圖形映射」兩份映射數位教材。「彩色方塊映射」數位教材包括：「映射教學」、「左右鏡射」、「上下鏡射」、「七彩鏡射」等主題。「圖形映射」數位教材包括：「教學示範」、「幾何鏡射」、「圖案鏡射」、「挑戰時間」等主題。
- 二、堆疊單元：目前有「彩色方塊堆疊」、「圖像視角遊戲」兩份堆疊數位教材。「彩色方塊堆疊」以填色遊戲方式認識視角。「圖像視角遊戲」主題是獵人養成班，包括「獵人訓練」、「眼力考驗」及「一起去打獵」三個關卡。

針對宜蘭縣南澳國小五年級原住民學童，進行「映射」與「堆疊」的CPS空間概念互動式數位教學示範活動，進行兩單元之生活化題組式評量的表現，顯示課後成績皆顯著優於課前成績。

上述教材與評量皆置於2013原住民科學教育計畫CPS教學平台
http://www.uuulearn.com.tw/cps_platform/。

關鍵詞：原住民學童、協作式問題解決、空間概念能力

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Digital Materials—“Mapping and Stacking”

Jen-Yi Chao¹ Yi-Han Huang² Hsiao-Chi Kao³

Abstract

The integrated project, “The development and establishment of a CPS teaching and assessment platform for spatial concept courses for indigenous students”, researches and develops digital materials for mathematical concepts, such as “mapping” and “stacking”. The subjects studied are senior students of the primary school. Teachers can use the interactive digital materials as an assistive tool to teach, while students can use the tool to learn. The teaching model used is the Collaborative Problem Solving (thereafter, “CPS”).

Before and after the interactive digital CPS teaching activities, students are assessed by a set of questions on space concept of daily life to evaluate the effectiveness and the appropriateness of the digital materials.

The interactive materials are composed of flash animation, as listed below:

1. Mapping: We develop two digital materials: “Color Square Mapping” and “Shape Mapping”. The teaching materials for “Color Square Mapping” include: Mapping Teaching, Left and Right Mirror Mapping, Up and Down Mirror Mapping, and Mirror Mapping of Seven Colors, etc. The teaching materials for “Shape Mapping” include: Teaching Demo, Geometry Mirror Mapping, Pictures Mirror Mapping, and Time for Challenge, etc.
2. Stacking: We develop two digital materials: “Color Square Stacking and Picture Viewing Angle Game”. “Color Square Stacking” is a color game to understand the concept of “angle of view”. “Picture Viewing Angle Game” is a game of hunter training courses. The game has three levels: “Hunting Training”, “Eyesight Testing” and “Let's Hunt Together”.

We conducted an experiment on the aboriginal students who are fifth grade students of Nan-ao Primary School in Ilan County. The students’ performances for question-set assessments in these two concepts after the teaching demonstration were markedly better than before the demonstration.

The aforesaid teaching materials and assessment tools are placed on the CPS teaching platform of 2013 Aboriginal Science Education Project, which can be found on the following website: http://www.uuulearn.com.tw/cps_platform/

Keywords: aboriginal students, collaborative problem solving, spatial concepts

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原住民學童接受文化融入自然與生活科技教學之研究教材展示 -以簡單機械為例

高慧蓮¹ 張祈良²

摘要

本研究目的在探討原住民學童接受「簡單機械」單元電子書教學之學習成效，主要以ADDIE (Analysis, Design, Development, Implement, Evaluate)模式發展數位教材。

研究對象屏東縣國民小學，2所原住民偏鄉學校。因配合學校教學時程，故選擇五年級學生為樣本。本研究透過研究工具以學生接受電子書教學後「學習意見晤談」作為質性分析，藉此瞭解接受電子書教學後學習成效與學習興趣的表現情形。

關鍵詞：電子書、ADDIE、簡單機械、學習成效、學習興趣

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Explore the Effectiveness of Science Stories E-book Learning Outcomes of Han and Indigenous Elementary School Children: Taking a Simple Mechanical Unit as an Example

Huey-Lien Kao¹ Chi-Liang Chang²

Abstract

The main purpose of this study was to explore the Indigenous students' learning effectiveness of accepting the "simple machines" unit e-book teaching. The study adopted mainly the ADDIE (Analysis, Design, Development, Implement, and Evaluate) model to develop digital teaching materials. And the study took a quasi-experimental research: experimental group taken eBook; the control group taken paper teaching.

The research objects were two elementary schools in Pingtung County: two Indigenous schools respectively. To tie in with teaching programme of the schools, the study chose fifth grade students: two Indigenous schools, one class as the experiments group and another class as the control group. The study also adopted students' interviews of learning opinion after receiving E-book teaching as the qualitative analysis to learn about the different ethnic groups learning effectiveness and learning performance of interest situation after receiving E-book teaching.

Keywords: e-book, ADDIE, simple mechanics, learning effectiveness, learning interests

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原住民族非制式化科學教育活動營教案

林春鳳¹ 鄭清平² 陳盈靜² 楊坤璋²

摘要

本教案主要目的為深化原住民族重點學校教師對原住民族文化及科學之概念，同時希望教師能將其教材及教案內容延伸應用在一般學科中，以持續提升學生學習興趣及學習成效。本教案的內容主要是以文化本位為主體，將原住民族文化背景編入自然、數理與生活科技等科學知識體系，進而設計出以原住民族文化為內涵的科學教育參考資料。

從98年8月開始，歷經4年的研究、討論與試教等過程，目前已發展完成排灣族、阿美族、布農族、雅美族、魯凱族等五個族群科學課程教案。而從102年8月開始與原住民族重點國民小學合作辦理「原住民族非制式化科學教育活動營」，此營隊連結該校老師與部落人士共同授課，以三至六年級學童為參與對象，截至目前為止，已進行了63場次的原住民族非制式化科學教育活動，共2327位學生參與。

阿美族學校23所中共有501位學生最喜愛的單元為「大海與我」；排灣族19所學校中共有500位學生最喜愛的單元為「排灣族傳統食物」；布農族17所學校中共有357位學生，最喜愛的單元為「超級獵人」；雅美(達悟)族3所中學校共有50位學生最喜愛的單元為「我們的家」，魯凱族1所學校共有37位學生最喜愛的單元為「魯凱族狩獵」。

關鍵詞：原住民族、科學教育、學習興趣、學習成效

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Lesson Plan Development for an Indigenous Informal Science Education Camp

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Abstract

The main objective of the lesson plan is to enrich and deepen the concept of Indigenous culture and science for teachers at Indigenous schools, and to help them extend the teaching materials into other general subjects in order to enhance students' learning interests and outcome. The lesson plan development started by using Indigenous culture as the main body and incorporated relevant theory and knowledge of life science, mathematics, technology, and other scientific knowledge system. The final lesson plan can serve as a reference material for science education with Indigenous cultural connotation.

The development started in August 2009, after 4 years of research, discussion and trial lesson, we have developed science education lesson plans for 5 Indigenous groups. In August, 2013, the research team started to work with Indigenous schools to implement the Indigenous Informal Science Education Camp. The camp worked with teachers from the Indigenous schools and people from the Indigenous community to carry out the lessons. The target students range from grade 3 to 6. Up to 2015, we had hosted 63 camps with a total 2327 students participated.

Among the 23 Amis school, 501 students choose "the Ocean and Me" as the favorite lesson; the 500 students from the 19 Paiwan schools prefer "the Paiwan Traditional Food" lesson plan the most; the 357 students from the 17 Bunun schools liked the "Super Hunter" the most; the 50 students from the 3 Yami (Tao) schools preferred "Our Home" as their favorite lesson plan; while the 37 students from the one Rukai school liked the "Rukai Hunting" the most.

Keywords: indigenous peoples, science education, learning interest, learning efficacy

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賽德克族文化融入小學二年級數學概念之教材設計

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摘要

本教材設計旨在以賽德克族的文化為主軸，將賽德克族的文化內涵融入國小二年級的數學概念中，進而發展一套具有賽德克族文化的數學繪本，期盼賽德克族學生能夠在自身的文化情境中學習數學，並具備解決生活中的數學之能力，也希望透過繪本教學，提昇賽德克族學生的數學學習動機。本教材所使用的數學概念以國小二年級為主，其中包含：公分的實測、平分與分裝、乘法的意義、平面圖形的邊長關係，隨著繪本故事的發展，學生將一一解決這四道問題。課程結束之後，本團隊將透過闖關活動，檢視學生的數學迷思概念是否釐清，並經由活動，讓學生反覆練習已學會的數學概念，使其印象深刻。

關鍵詞：文化融入數學概念、賽德克族

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The Material Design of the Second Grade Mathematic Conception in Seediq

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Abstract

The aim of this material is to integrate the culture connotation of Seediq into the mathematical concept of the second grade of the students, and to develop a set of mathematical picture books with the culture of Seediq. Seediq students can learn mathematics in their own cultural context and have the ability to solve mathematical problems in life. At the same time, the team hoped that through the teaching of picture books, the motive of mathematics learning will be improved. The mathematical concepts used in this material are mainly the second year of elementary school, which includes the measurement of the centimeter, sharing problems, the meaning of the multiplication, and the length of the graphic. With the development of the picture books, students will solve these four problems. At the end of the course, the team will examine the students' mathematical myths through activities, and make students memorize the math concepts learned through repeated activities.

Keywords: culture into mathematical concepts, Seediq

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