科技部補助專題研究計畫成果報告
期末報告

科學學習之情緒能力

計 畫 類 別 ：個別型計畫
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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

處 理 方 式 ：
1.公開資訊：本計畫可公開查詢
2.「本研究」是否已有嚴重損及公共利益之發現：否
3.「本報告」是否建議提供政府單位施政參考：否

中 華 民 國 104年03月20日

中文摘要： 本研究探討高中學生選擇學習進階科學的理由，並以質性和量化的混合方法來交叉驗證研究結果。本研究訪問 72 位高中理組與文組的學生，探討他們選擇學習進階科學的生活經歷，以及對各學術領域的興趣和信心的質性和量化覺知。質性分析顯示學生選擇所採資源的順序為興趣（材料）、信心（成就）、控制（策略）、價值（父母）和目標（設計）。質性和量化的結果也顯示領域和同儕比較的內隱機制。本研究結果顯示早期（中等教育之前）介入請學生反思、評估各項選擇的資源與情緒，將有利於學生科學學習與生涯的發展。

中文關鍵詞： 信心，興趣，科學學習，中學教育

英文摘要： This study investigates high-school students' rationales for choosing to study advanced sciences. A qualitative and quantitative mixed-methods methodology was used to cross-validate the findings. This study interviewed 72 high-school science and humanity students regarding their life experiences related to their choice of studying advanced sciences and their quantitative and qualitative perceptions of interest and confidence in academic domains. The results of qualitative data analysis show source priorities in the descending order of interest (materials), confidence (achievements), control (strategies), value (parents) and goal (designs). Both qualitative and quantitative results reveal the implicit mechanism of domain and peer comparisons. The findings suggest that early intervention (before secondary education) inviting student to reflect on and assess the sources and related emotions can benefit them in science learning and career.

英文關鍵詞： confidence, interest, science learning, secondary education

Introduction

Choosing to study advanced sciences in high schools implies student engagement and investment for higher education and long-term success in science careers. This high-stake issue inevitably invites wise strategy use in the process of making the choice to become science professionals. A strategic perspective towards student science study choices may help figure a comprehensive picture of student decision making, based on which educators can design effective educational measures, and make wise educational policies for science education and human development. In addition, the high-stake issue of choosing to study advanced sciences can provide a unique context for qualitative methodology to integrate diverse motivation theories with socio-cultural issues.

Students' decision to take advanced science courses may root in diverse aspects of major sources. Maltese and Tai (2010) indicate that the sources for student interest in science include self (e.g., like and curiosity) (45%), school or informal education activities (e.g., science camp and competition) (40%) and family (e.g., parent encouragement and pressure) (15%). The major aspects of sources for choosing to study advanced sciences therefore are likely to include personal motivations, learned knowledge and significant people.

Self sources for choosing to study science

Motivations. Motivations appears to be the most significant rationales for choosing sciences. Interest and confidence serves as the top reasons for choosing science (Venville, Rennie, Hanbury, & Longnecker, 2013).

Diverse psychological theories have also indicate likely motivational constructs that may relate to choosing science. Motivational sources for learning and achievements may include confidence, control, interest, value and goal (Pintrich, 2003). Self-determination theory suggests that intrinsic motivation is the most desirable compared with extrinsic and no motivations (Ryan & Deci, 2000). The expectancy–value theory indicates that achievement-related choices are determined by expectation of success and subject task values, which are influence by diverse precedent factors such as goals, affective memories, stereotypes, interpretation, culture, society aptitudes and achievement (Wigfield & Eccles, 2000). Ainley and Ainley (2011) posit a model that conceptualizes embedded interest as an outcome influenced by socio-economic status, science knowledge, personal value of science, enjoyment of science and interest in learning science. There appears to be a need to integrate the diverse components/theories of motivations into a model based on empirical data.

Strategies. Students may choose to study sciences because of their learning strategies match their perceptions of sciences. Some science students are attracted to sciences because science include tangible, logical and strict procedures while the other science students enjoy the science process, thinking problems and trying solutions (Holmegaard, Madsen, & Ulriksen, 2014).

Educational sources for choosing to study science

Domains of knowledge (school subjects). Students need to exercise their comparison between domains of knowledge or school subjects in order to make sound decisions to study advanced sciences courses in high school. Students are likely to make comparison between their achievements in different domains and thus form confidence beliefs (Marsh & Hau, 2004) or simply show preferences towards different domains (Paik & Shim, 2013).

Teaching activities. Science interest may be influenced by teachers' characteristics, comment and teaching activities such as projects, experiments and demonstration (Maltese & Tai, 2010).

Family sources for choosing to study science

Parents. High-school student college plan is highly related to parent involvement. Parent unconditional support, encouragement and persuasion provide formative science experience for sciences students (Maltese & Tai, 2010). Packard, Babineau and Machado's (2012) qualitative study show that Latina girls and their mothers in a harmonic agreement with choosing a vocation-preparation program for becoming nurse assistants in high school. The problem provides them secure job readiness, stable income and bright future in higher education as health professionals.

Jobs/careers. Science students identify a career when they interpret the career as being formative (special and beneficial), performative (practical), consequent (influential), and potential (expanding) (Hsu, Roth, Marshall & Guenette, 2009).

Other issues

Peers. Students may be influenced by peers. For example, a student in a high-achieving school may perceived a lower academic confidence than a student of the same ability in a low-achieving school, named the big-fish-little-pond effect (Chiu, 2012).

Time to choose. Most science students report early interest or commitment to science mostly at the primary education stage (Maltese & Tai, 2010; and Packard et al., 2012).

The above review of the literature suggests that diverse issues may take a role in student choice of studying advanced sciences. This study therefore aims to answer the following two research questions.

1. What are high-school science students' sources for choosing to study advanced sciences?
2. Are there differences between science and humanity students in confidence and interest in the sciences (mathematics, physics, chemistry, biology, and earth science), languages (Chinese and English), and social sciences (history, geography, and citizenship)?

Method

Participants

The research participants are 72 high-school students in Taiwan (43 girls and 29 boys; 4 10^{th}, 64 11^{th}, and 4 12^{th} graders). Most of the students are in their second-year of high school (i.e., Grade 11), when they have chosen to study course packages focusing on humanities and social sciences (i.e., history, geography and citizenship) (Package 1), physical sciences (advanced mathematics, physics and chemistry) (Package 2), or natural sciences (advanced mathematics, physics, chemistry and biology) (Package 3) in their schools. All of the students have to study Chinese, English and basic mathematics. Students in Grade 11 also have substantial knowledge about all of the different domains in the school system. Students who chose Packages 2-3 were named 'science students' (N = 48) and students who chose Package 1 were named 'humanity students' (N = 24) in this study. The academic course design in the national high-school curriculum, Taiwan, is presented in Table 1.

<Insert Table 1 around here.>

Data Collection

The research participants are interviewed individually and audio-recorded. The interview included two sets of guiding questions to elicit the participants' stories and rationales for choosing to study advanced sciences and their concerns, strategy use, confidence, and interest in science and humanity subjects.

1. What kinds of course package do you choose (or expect to choose, for Grade 10 students): humanities and social sciences (Package 1), physical science (Package 2), or natural science (physical sciences and biology) (Package 3)? What are your reasons for choosing this course packages? (Follow-up questions: When do you find that that you are suitable for this course packages? Please narrate all your life stories relating to this? What are your concerns (feelings) in the life stories? What are the significant people, events, and materials etc. that influence your choose?)
2. For mathematics (physics, chemistry, biology, earth science, Chinese, English, history, geography, and citizenship, respectively)

(1) What are your concerns about this academic subject?
(2) What are your strategies for learning this academic subject?
(3) How is your interest in learning this academic subject? (1 = very low ~ 10 = very high) Reasons?
(4) How is your confidence in learning this academic subject? (1 = very low ~ 10 = very high) Reasons?

The interviews last around one hour.

Data Analysis

The interviews were conducted in Chinese. All of the interviews were fully transcribed and analysed by the methodologies of general qualitative data analysis (Kahlke, 2014; Miles & Huberman, 1994) with elements of narrative analysis (Labov, 2006), phenomenography (Marton, 1981) and grounded theory (Charmaz, 2000; Strauss & Corbin, 1990, 2007). The procedure include open coding, story figuration, constant comparison and theoretical saturation. The open-coding procedure was partially supported with the software Atlas.ti Version 6.0.15 (Atlas.ti GmbH, Berlin, Germany).

Research Questions 3 was answered using multivariate analysis of variance (MANOVA) with the software of R Version 3.1.0 (2014-04-10) (R Core Team, http://www.R-project.org/). The between-subject independent variable was science/humanity students and the within-subject dependent variables were student interests and conferences in the 20 subjects. The results obtained by quantitative data analysis were interpreted with help from the results of qualitative data analysis for Research Question 1.

Results

Science students' sources for choosing to study advanced sciences

The major sources for choosing to study advanced sciences include personal interest in science, confidence in science ability, strategy in controlling learning results, values by parents, and goals by teaching and examination designs. Comparison between knowledge domains and peers also pay a partial role in student choice of studying advanced sciences.

Interest: First and mysterious responses to the unique essence of the domains (teaching material itself)

Students' first typical responses to the reviewer's questions about their rationales for choosing to study advanced sciences (Course Packages 2-3) in Grade 11 are their personal inherent interests. After the interviewer asked 'Why do you choose the (physical or natural sciences) course package?', most students' responses focused on interest.

- I am interested in natural science very much. (girl, Grade 11, Package 3, east Taiwan, id = a01)
- I don't like geography, history and citizenship. (girl, Grade 11, Package 3, north Taiwan, id = ss19)
- I don't like to memorize social science subjects. (boy, Grade 11, Package 2, south Taiwan, id = sk08)

The teaching materials serve as the major sources of finding personal interest in a domain.

- When I learnt chemistry and biology in Grade 10, I felt interested. (girl, Grade 11, Package 3, east Taiwan, id = a01)
- I like to see the foreign photos in the geography textbook. (boy, Grade 11, Package 2, south Taiwan, id = sk08)

Confidence: Second response relating to achievement and ability

After the students stated that they choose to study advanced sciences because of personal interests, the interviews asked follow-up questions such as 'why are you so interested in sciences?' Students' second typical responses to the follow-up questions are normally related to their concerns about test results.

- I cannot get good results in geography, history and citizenship. I spend much time on these subjects but the results are still not ideal. (girl, Grade 11, Package 3, north Taiwan, id = ss19)

Control: Effective learning strategies

Some students can delve into the rationales of learning strategies for low confidence or interest in humanity and social sciences.

- I choose Package 2 because biology needs memorization although chemistry also needs memorization. (boy, Grade 11, Package 2, south Taiwan, id = sk08)
- I think and use ‘problem sea’ (practicing many problems) as strategies to learn math and the strategies work. I use all strategies such as preview, ‘problem sea’ … for history but still fail. (girl, Grade 11, Package 3, north Taiwan, id = ss19)

Value: Job expectations by parents

Some students are highly influenced by their parents in choosing to study advanced sciences, especially Package 3.

- I choose natural science because I hope to become a medical doctor. My parents both are medical doctors. They are always my role models… They say that being doctors would be better…I think the most important thing is to take care of the people around. A family need someone understand medicine to avoid fear. I can save people around me….This is my own thought. (girl, Grade 11, Package 3, north Taiwan, id = ss19).
- Dad want me to be a doctor…because he wanted me to inherit his job. (boy, Grade 11, Package 3, north Taiwan, id = sp08)

Goal: Teaching and examination designs

Teaching and examination designs set the scene of student learning and choices. Student may fit or not fit to the goal structures of the Teaching and examination designs.

- I really like my Grade 10 mathematics teacher. He lets us use our brains. Sometimes he shows us some special toys, like a chain. He use the formula like playing toys trying to use the shortest solutions to do mathematics and play games. I feel it is very interesting. ...Some classmates don’t like. They like to solve problems and go to cram schools and then study social science. (girl, Grade 11, Package 3, north Taiwan, id = ss19)
- Student: My older sister said that: 'If you do not know what to do, you can choose Package 3, in which you can learn more and make another choice. You can have more options. Choose Package 3, choose more.
  Interviewer: But Package 1 also include many subjects.
  Student: But Package 1 is relatively shallow. (boy, Grade 11, Package 3, north Taiwan, id = sp08)

Domain comparison

Students make comparisons between domain and peers for making their choice while exercising their interest, confidence, control, value and goals sources. For example, after the interviewer asks 'why do you choose Package 2?', a student responses:

- It is because I am not good at social sciences. I am better at national sciences.... I am not interested social sciences. (girl, Grade 11, Package 2, east Taiwan, id = sa05)

Peer comparison

Differences between science and humanity students in confidence and interest in academic subjects

The results of MANOVA show significant differences between science and humanity students in subject interest and confidence with a large effect size (Wilks' lambda = .52, $F(20,51) = 2.37$, $p = .0067$, $\eta^2 = .48$, small effect size $.01 < \eta^2 < .06$; medium effect size $.06 < \eta^2 < .14$; large effect size $\eta^2 > .14$ (Cohen, 1988, p. 283)).

Science students have higher interest and confidence in mathematics and chemistry, higher interest in physics and biology, and lower interest and confidence in history, geography, and citizenship than humanity students (Table 2).

<Insert Table 2 around here.>

Additional analysis: Relationships between conference and interest to validate qualitative results

The correlations between interests and confidences in the ten academic domains partially validate the findings obtained by the qualitative study (Table 3). The correlations between interests and confidences in the same domains are all significant and from moderate to high (r = .53 ~.75) (Taylor, 1990), which suggest the strong relationships between interest and confidences within a domain. Further, the within-domain correlation between interests and confidences (r = .53 ~.75) than the other pairs of correlations (r = .52 ~ -.01), which provides partial evidence that domain comparison occurs in students choice of studying advanced sciences.

Discussion

Source priorities: Interest (materials), confidence (achievements), control (strategies), value (parents) and goal (designs)

Choosing to study advanced sciences is both individual and social processes Holmegaard, Ulriksen, & Madsen, 2014). Students have to negotiate between multiple individual and social sources. Domain comparison tend to be an individual process while peer comparison a social one. Interest (materials) and control (strategies) sources relatively undergo an individual process while value (parents) and goal (designs) tend to be a social process. Confidence (achievements) appears to include both individual and social processes.

Implicit mechanism: Comparison between knowledge domains and with peers.

Qualitative results reveal the self sources (motivations and strategies) are the major rationales for choosing sciences. The quantitative results show differences between science and humanity students in the interest and confidences in the ten academic domains. The two findings suggest implicit mechanisms of domain and peer comparisons. The high relationships between interest and confidence within the same domains, compared with the low ones between domains, further implied domain specific in interests and confidences.

The findings indicate that the current educational policy and examination designs that all students have to study all knowledge subjects may be ineffective for student learning. Early intervention (before secondary education) from multiple sources for inviting student engagement and interest in sciences may be needed.

Limitations and implications for future research and educational practices

Future research can verify the strong relationship between conference and interest indicated by the research participants in this study.

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Table 1

Design of academic domains in the national high-school curriculum, Taiwan.

Students \ Domains		Maths	Physics and chemistry	Biology	Earth science	Chinese and English	History, geography and citizenship
Grade 10	All	basic	basic	basic	basic	same	basic
Grades 11-12	Package 1	basic	basic	basic	basic	same	advanced
	Package 2	advanced	advanced	no	(optional)	same	basic
	Package 3	advanced	advanced	advanced	no	same	basic

Table 2

Means (Ms), Standard Deviations (SDs) and MANOVA Results for Science vs. Humanity Students in Subject Interest and Confidence

		Science students		Humanity students		*MANOVA*	
Subjects	Affects	*M*	*SD*	*M*	*SD*	*F*	*p*
Mathematics	Interest	7.31	1.91	5.04	2.69	17.02	.0001
	Confidence	6.52	1.99	5.29	2.29	5.51	.0217
Physics	Interest	6.33	1.93	4.33	1.95	17.10	.0000
	Confidence	5.50	1.88	4.75	2.17	2.30	.1343
Chemistry	Interest	6.85	1.47	5.00	1.87	21.16	.0000
	Confidence	6.67	1.33	5.17	2.20	12.99	.0006
Biology	Interest	7.04	2.04	6.04	1.78	4.17	.0450
	Confidence	6.92	1.43	6.67	1.69	.43	.5118
Earth science	Interest	5.90	2.00	5.54	2.19	.47	.4949
	Confidence	6.25	1.95	6.71	1.60	.99	.3235
Chinese	Interest	6.31	1.93	6.71	1.94	.67	.4153
	Confidence	6.27	2.05	6.88	1.70	1.55	.2176
English	Interest	6.35	2.18	6.92	2.12	1.08	.3013
	Confidence	6.19	2.14	6.79	1.79	1.41	.2385
History	Interest	4.65	2.20	7.08	2.34	18.86	.0000
	Confidence	4.79	2.06	6.50	2.17	10.62	.0017
Geography	Interest	5.62	1.84	6.71	1.55	6.14	.0157
	Confidence	6.02	1.67	6.92	1.67	4.61	.0352
Citizenship	Interest	5.56	1.98	7.00	1.62	9.49	.0029
	Confidence	5.65	1.79	7.25	1.62	13.63	.0004

Table 3

Correlations between Interests and Confidences in Ten Academic Domains

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Mathematics interest																			
2. Mathematics confidence	.73																		
3. Physics interest	.48	.29																	
4. Physics confidence	.20	.37	.70																
5. Chemistry interest	.52	.24	.50	.11															
6. Chemistry confidence	.29	.31	.35	.36	.70														
7. Biology interest	.14	.07	.29	.05	.33	.06													
8. Biology confidence	.04	.25	.17	.33	.01	.09	.69												
9. Earth science interest	.26	.20	.20	.10	.36	.11	.40	.30											
10. Earth science confidence	-.02	.23	.03	.31	.09	.21	.13	.40	.60										
11. Chinese interest	-.07	-.18	-.01	-.07	-.01	-.01	.12	.00	.14	.17									
12. Chinese confidence	-.30	-.22	-.07	.09	-.04	.17	.02	.11	.01	.40	.64								
13. English interest	.09	-.12	.05	-.03	-.07	-.09	.04	-.02	.11	-.01	.30	.08							
14. English confidence	-.09	-.07	.02	.19	-.13	.06	.01	.16	.01	.17	.12	.34	.66						
15. History interest	-.41	-.35	-.27	-.11	-.35	-.35	.08	.18	.27	.28	.22	.27	.11	.08					
16. History confidence	-.45	-.22	-.18	.17	-.32	-.10	.02	.26	.10	.36	.19	.46	-.03	.23	.75				
17. Geography interest	-.10	-.06	-.13	-.06	-.12	-.23	.31	.32	.48	.41	.18	.15	.19	.08	.58	.35			
18. Geography confidence	-.13	.02	-.06	.15	-.19	-.13	.18	.41	.23	.46	.08	.30	.14	.24	.49	.49	.70		
19. Citizenship interest	-.18	-.24	-.14	-.06	-.09	-.19	.18	.13	.36	.34	.44	.32	.22	.18	.58	.39	.50	.37	
20. Citizenship confidence	-.30	-.12	-.03	.24	-.25	.02	-.16	.03	.11	.49	.33	.52	.19	.39	.47	.56	.25	.38	.53

Note. The correlations underlined are significant at the .05 level.

科技部補助專題研究計畫出席國際學術會議心得報告

日期：103 年 9 月 14 日

計畫編號	MOST 102-2511-S-004-004		
計畫名稱	科學學習之情緒能力		
出國人員姓名	邱美秀	服務機構及職稱	國立政治大學教育學系 教授
會議時間	103 年 9 月 8 至 103 年 9 月 10 日	會議地點	Nagoya, Japan (日本名古屋)
會議名稱	(中文)訊息與社會科學國際會議 (英文) International Conference on Information and Social Science (ISS 2014),		
發表題目	(中文)選讀進階科學的資源 (英文) Sources for choosing to study advanced sciences		

一、 參加會議經過

9 月 8：註冊、參加 reception、keynote speech、會議安排的學術與交流活動。

9 月 9：發表論文、主持論文發表、參加會議安排的學術與交流活動。

9 月 10：參加會議安排的學術與交流活動。

二、 與會心得

1. 此會議由四個會議共同合辦，論文發表為同時在數個場次舉行。此四個會議分別是 2014 International Conference on Information and Social Science、2014 International Congress on Economy, Finance and Business、2014 International Symposium on Culture, Arts and Literature、2014 International Symposium on Marketing and Logistics。第一個會議的主席是日本學者，其他三個會議的主席均為臺灣學者，許多會議現場的服務人員是臺灣人。參與論文發表的學者大多來自亞洲(臺灣、日本、巴林、泰國、馬來西亞、印尼)，其次，也有來自土耳其、澳大利亞、蘇俄的學者。
2. 臺灣學者能在海外主辦會議，真的是很不容易。私下了解，臺灣學者用了一些個人的人力資源來辦此活動，其精神令人感佩。
3. 在這個會議中，聽到了很多亞洲觀點，雖然大多學者非以英文為母語，但似乎也只能以英語溝通，才能讓所有的人都聽得懂。從會議參與的過程，看到亞洲學者在公開會議中的討論氣氛較弱，但是私下的討論，似乎較為熱烈 (相較於之前參與西方學者為主的會議)。私下，也與泰國學者討論到此觀察，發現東方文化似乎有此共通性。
4. 參加了多場的論文發表，論文水準不錯。雖然文化不同，但是，學術的用語、論文發表的結構與形式，似乎全球已達一致的程度，也就是，東西方沒有明顯的不同，甚至，因為東方學者非以英文為母語，似乎更重視簡報內容的清楚呈現。
5. 因為這個會議有來自社會科學、人文各領域的學者，故除了教育的場次，也參與了一些商學、管理、史學、文學方面的論文發表場次，能和不同領域的學者討論共同的議題，覺得頗有收穫，另外，也發現商管方面的研究方法與教育心理頗為接近，商管與教育的理論交互使用，也許也是一個取向。

三、發表論文全文或摘要

Sources for choosing to study advanced sciences

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Aim. This study investigates the rationales for choosing to study advanced sciences reported by high-school students. Qualitative and quantitative mixed-methods are used to cross-validate the findings.

Review of literature. Choosing to study advanced sciences implies student engagement and investment for long-term success in science careers. This high-stake issue inevitably invites wise strategy use in the process of making the choice to become science professionals. A strategic perspective towards student science study choices may help model the accurate process of student decision making, design effective educational measures, and make wise educational policies for science education and human development.

Research questions. (1) What are high-school science students' perceptions of life experiences related to their choice of studying advanced sciences? (2) What are high-school science students' knowledge beliefs (and strategy use), confidence, and interest in science subjects (mathematics, physics, chemistry, biology, and earth science) and humanity subjects (Chinese, English, history, geography, and citizenship)? (3) Are there differences between science and humanity students in their confidence and interest in the science and humanity subjects?

Method. This study interviewed 72 high-school science and humanity students regarding their life experiences related to their choice of studying advanced sciences and their knowledge beliefs (and strategy use), confidence, and interest in science and humanity subjects. The verbatim transcripts of the interviews were analyzed by the methodologies of general qualitative data analysis, phenomenography, and grounded theory.

Results. (1) Sources for choosing studying advanced sciences include personal interest, ability in sciences, vocational values, college examination policy, parents, teachers, and peers. (2) Most students report that their interest in science begin before secondary education. Deep learning strategies and efforts are used for studying sciences, while surface learning approaches and examination preparation are their focus in studying humanity subjects. (3) Science students have higher interest and confidence in mathematics and chemistry, higher confidence in physics, and lower interest and confidence in history, geography, and citizenship than humanity students.

Discussion. The findings indicate that the current educational policy and examination designs that all students have to study all knowledge subjects may be ineffective for student learning. Early intervention (before secondary education) for inviting student engagement and interest in sciences may be needed.

Keywords: confidence, interest, science learning, strategy, secondary education.

四、建議

1. 臺灣學者在海外，主動且有計畫的主導國際的學術活動，其精神令人敬佩。有時，學者的國際活動能力與動力，是國力延伸的表現。不確定政府對此類活動的支持度，但是，學者的國際活動，應該是能有系統的影響國際學術的運作，也能具體的提升國力，應該是值得肯定的。
2. 從泰國學者的論文發表，以及和他們在會議中與事後的討論，發現泰國的高教政策是將所有的公立大學，逐漸轉型為 autonomy 的大學，也就是政府對公立大學的補助從 100%降低一些(但仍會維持到 50%以上，例如 70-80%)，目前先轉型的是一些較為 top、經費較能自足的公立大學，其他公立大學仍先維持現狀。泰國的公立大學發展，可能會朝向公立大學部分自主、學費略漲的方向，以便能提升大學行政效能與國際競爭力。泰國的學者似乎已接受此發展，但與來自另一國家的歷

史學者討論此，此歷史學者並不贊成此「大學教育商業化」的趨勢。至於臺灣的高教發展將會如何？可能仍有待大家的討論。

五、攜回資料名稱及內容

1、會議手冊(紙本)，含 keynote speaker 的簡介與演說主要內容、會議相關資訊、議程(含各會議 chairs 的個人與會議簡介、時間安排、所有與會者名單、論文名稱…等)。

2、會議論文集(電子檔)，含此會議的所有論文內容。

六、其他

論文發表之大會證明文件


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awarded to

Mei-Shiu Chiu

In Recognition of Participation and Valuable Presentation

Shigeki Yokoi

Conference Chair

科技部補助計畫衍生研發成果推廣資料表

日期:2015/03/20

科技部補助計畫	計畫名稱: 科學學習之情緒能力
	計畫主持人: 邱美秀
	計畫編號: 102-2511-S-004-004-　　學門領域: 科學教育

無研發成果推廣資料

102 年度專題研究計畫研究成果彙整表

計畫主持人：邱美秀	計畫編號：102-2511-S-004-004-
計畫名稱：科學學習之情緒能力	

成果項目			量化：實際已達成數（被接受或已發表）	量化：預期總達成數(含實際已達成數)	量化：本計畫實際貢獻百分比	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）
國內	論文著作	期刊論文	0	0	100%	篇	
國內	論文著作	研究報告/技術報告	0	0	100%	篇	
國內	論文著作	研討會論文	1	0	100%	篇	邱美秀(2013)。Is the science education for all high-school students curriculum fair? Teacher and student opinions。論文發表於第 29 屆科學教育國際研討會，國立彰化師範大學，彰化，2013 年 12 月 12-14 日。
國內	論文著作	專書	0	0	100%		
國內	專利	申請中件數	0	0	100%	件	
國內	專利	已獲得件數	0	0	100%	件	
國內	技術移轉	件數	0	0	100%	件	
國內	技術移轉	權利金	0	0	100%	千元	
國內	參與計畫人力（本國籍）	碩士生	0	0	100%	人次	
國內	參與計畫人力（本國籍）	博士生	0	0	100%	人次	
國內	參與計畫人力（本國籍）	博士後研究員	0	0	100%	人次	
國內	參與計畫人力（本國籍）	專任助理	0	0	100%	人次	
國外	論文著作	期刊論文	2	0	100%	篇	Chiu, M.-S., Yeh, H.-M., & Whitebread, D. (2014). Student constructs of mathematical problems: Problem types, achievement and gender. Cogent Education, 1, 961252. http://www.tandfonline.com/doi/full/10.1080/2331186X.2014.961252 (NSC 102-2511-S-004-004) Leu, Y.-C. & Chiu, M.-S. (2015). Creative behaviours in mathematics: Relationships with abilities, demographics, affects and gifted behaviours. Thinking Skills and Creativity. http://dx.doi.org/10.1016/j.tsc.2015.01.001 (NSC 99-2511-S-152-003-MY3； NSC 101-2511-S-004-001； MOST 102-2511-S-004-004).
國外	論文著作	研究報告/	0	0	100%	篇	

		技術報告					
		研討會論文	1	0	100%		Chiu, M.-S. (2014). Sources for choosing to study advanced sciences. Paper presented at the International Conference on Information and Social Science (ISS 2014), Nagoya, Japan, 8-10 September.
		專書	0	0	100%	章/本	
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（外國籍）	碩士生	0	0	100%	人次	
		博士生	0	0	100%		
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		

其他成果 (無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。)	無

	成果項目	量化	名稱或內容性質簡述
科教	測驗工具(含質性與量性)	1	高中生選讀進階科學的資源訪談問題。

處計畫加填項目	課程/模組	0	
	電腦及網路系統或工具	0	
	教材	0	
	舉辦之活動/競賽	0	
	研討會/工作坊	0	
	電子報、網站	0	
	計畫成果推廣之參與（閱聽）人數	0	

科技部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） 1、學術成就：研究成果包括已發表 SSCI 期刊論文 1 篇、其他國際期刊論文 1 篇、國際學術研討會論文 1 篇，國內學術研討會論文 1 篇，由參與研討會所得之與會學者建議，將持續修改與加強論文內容，投稿至學術期刊。另有 working papers 撰寫中。 2、技術創新：籍由質性研究，產生數個可解釋學生學習情緒能力的數個模式。量化研究則產生量表，以解釋更多的群體。 3、社會影響：研究結果將有助於了解學生科學學習的生涯發展，也有助於教學工作者順利進行教學工作、研發後續適性的教學方法。