

# 行政院國家科學委員會專題研究計畫 成果報告

## 以 Q 方法探討訓練學員應用 Web 2.0 Twitter 於形成性評 鑑之認知 研究成果報告(精簡版)

計畫類別：個別型  
計畫編號：NSC 99-2511-S-216-001-  
執行期間：99年08月01日至100年07月31日  
執行單位：中華大學科技管理學系(所)

計畫主持人：陳俐文

計畫參與人員：碩士班研究生-兼任助理人員：蘇桂筠  
碩士班研究生-兼任助理人員：姜宏儒

公開資訊：本計畫涉及專利或其他智慧財產權，2年後可公開查詢

中華民國 100 年 10 月 31 日

**中文摘要：** 本研究目的為了解受訓學員對於應用 Web 2.0 Twitter 於形成性評鑑之意見。本研究在台北某一大學推廣教育中心透過 Twitter 讓學員在「研究方法」訓練課程進行十二周的形成性評鑑。本研究應用 Q 方法(Q-methodology) 將所蒐集到的資料以量化分析受訪者主觀性的質化資料，此種研究方法有助於了解個體或群體之意見或態度。研究訪問三十九位任職於不同組織的受訓學員，學員透過具名團體技術法(Nominal Group Technique, NGT) 指出陳述，受試者於第二次受訪時將按一組陳述句描述以作等級排列，受試者表達他們對本研究主題的意見根據他們個人同意程度排列出「最同意到最不同意」的順序。本研究資料分析應用重心法(Centroid Factor Analysis) 和判斷式轉軸法(Judgmental Rotation)分析受訓學員特性所形成的數個集群，而同一集群內學員具有高度的同質性認知。本研究結果指出：(1) 受訓學員都認同線上形成性評鑑(Online Formative Evaluation) 的成效，(2) 受訓學員因認知類別的不同而區分成兩個集群：因素 I - 全方位的採納者(Full-Range Adopters) 和因素 II - 批判推特的採納者(Twitter-Critical Adopters)，(3)因素 I 和因素 II 的受訓學員都同意因為此訓練方式可透過學員的批判性反思、系統的隱私性、學員的線上去抑行為(Online Disinhibition Behaviors)、及教師的即時回饋而提升學習效果。本研究結論指出不同集群的受訓學員都認同線上形成性評鑑於教育訓練的重要性，但仍有待解決之相關後續問題。

**英文摘要：** The purpose of this study is to identify the perceptions of trainees on using the Web 2.0 application Twitter for formative evaluation. Twitter was integrated in a Research Methodology classroom at a continuing education center of a private university in Taipei for twelve weeks. Q-methodology was used for this study. Thirty-nine participants were surveyed and asked to rank-order 30 statements about the integration of Twitter in the classroom. Correlation, centroid factor analysis, and judgmental rotation were employed to derive significant factors. Two factors that represent groups of participants with similar perceptions were extracted. The results of this research have illustrated the followings: (1) all of the participants agreed the importance of online formative evaluation, (2) trainee opinion types can be differentiated into Factor I (Full-Range Adopters) and Factor II (Twitter-Critical Adopters), and (3) Factor I and Factor II participants agreed that the integration of Twitter into the classroom enhanced learning because of critical reflections, privacy settings, online disinhibition behaviors, and prompt responses. The findings reaffirm the importance of online formative evaluation in underpinning course pedagogy ; however, a number of minor, foreseeable issues still need to be resolved.

行政院國家科學委員會補助專題研究計畫  成果報告

以 Q 方法探討訓練學員應用 Web 2.0 Twitter 於形成性評鑑之認知

**Trainees' Perceptions on Using Web 2.0 Application Twitter to  
Support Formative Evaluation: A Q-Methodology Study**

計畫類別： 個別型計畫  整合型計畫

計畫編號：NSC 99-2511-S-216-001

執行期間：2010 年 8 月 1 日至 2011 年 7 月 31 日

執行機構及系所：中華大學科技管理學系(所)

計畫主持人：陳俐文

共同主持人：

計畫參與人員：碩士班研究生兼任助理-姜宏儒、蘇桂筠

成果報告類型(依經費核定清單規定繳交)： 精簡報告  完整報告

本計畫除繳交成果報告外，另須繳交以下出國心得報告：

赴國外出差或研習心得報告

赴大陸地區出差或研習心得報告

出席國際學術會議心得報告

國際合作研究計畫國外研究報告

處理方式：除列管計畫及下列情形者外，得立即公開查詢

涉及專利或其他智慧財產權， 一年  二年後可公開查詢

中 華 民 國 100 年 10 月 1 日

## Abstract

The purpose of this study is to identify the perceptions of trainees on using the Web 2.0 application Twitter for formative evaluation. Twitter was integrated in a Research Methodology classroom at a continuing education center of a private university in Taipei for twelve weeks. Q-methodology was used for this study. Thirty-nine participants were surveyed and asked to rank-order 30 statements about the integration of Twitter in the classroom. Correlation, centroid factor analysis, and judgmental rotation were employed to derive significant factors. Two factors that represent groups of participants with similar perceptions were extracted. The results of this research have illustrated the followings: (1) all of the participants agreed the importance of online formative evaluation, (2) trainee opinion types can be differentiated into Factor I (Full-Range Adopters) and Factor II (Twitter-Critical Adopters), and (3) Factor I and Factor II participants agreed that the integration of Twitter into the classroom enhanced learning because of critical reflections, privacy settings, online disinhibition behaviors, and prompt responses. The findings reaffirm the importance of online formative evaluation in underpinning course pedagogy; however, a number of minor, foreseeable issues still need to be resolved.

**Keywords】** Summative Evaluation, Formative Evaluation, Microblog, Social Network, Twitter

## Introduction

Numerous studies have focused on using Web 2.0 technologies in teaching and learning (Churchill, 2009; George, & Dellasega, 2011; Meyer, 2010; Siemens & Conole, 2011; Tekinarslan, 2008; Williams & Jacobs, 2004). Although there has been growing interest in using various Web 2.0 tools for student assessment tasks in tertiary education (Waycott, & Sheard, 2011), rather less attention has been paid to explore participants' views of using Web 2.0 applications for formative evaluation. It should be noted that formative evaluation, also known as developmental evaluation, involves collecting qualitative data about the training sessions in order to improve the training process; whereas summative evaluation is conducted to determine the extent to which trainees have changed after participating in the training programs (Swanson, & Holton, 2009). Overall, the purpose of this study is to identify and categorize perception of trainees regarding using Web 2.0 application Twitter for formative evaluation. The research questions that guide the study are as follows:

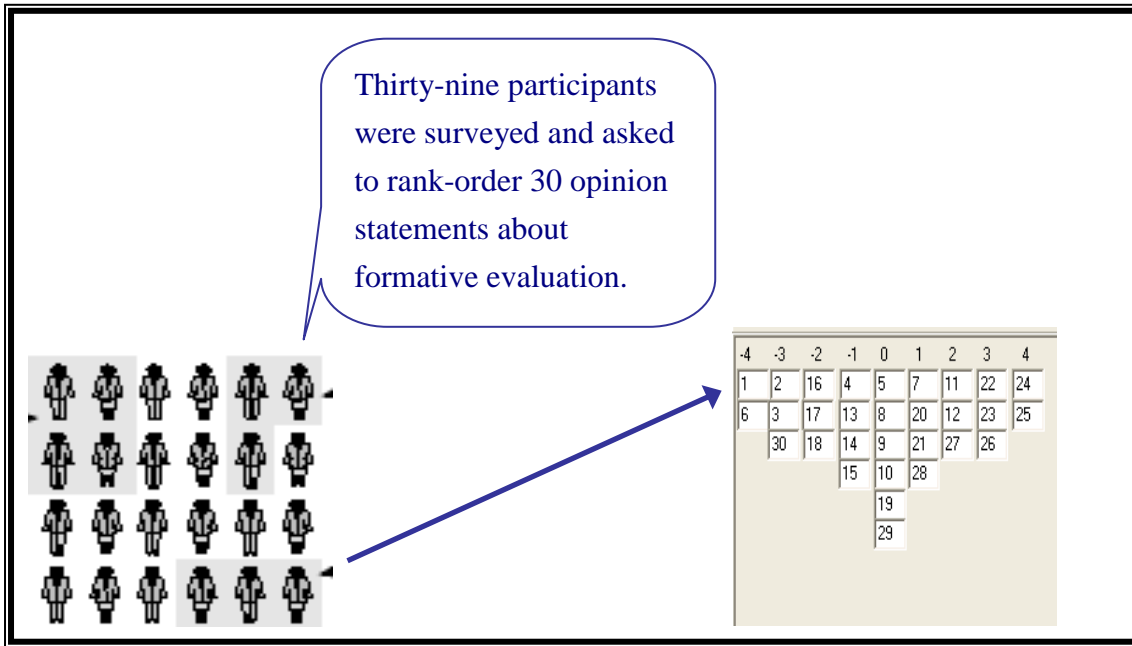
1. What are the subjective opinions of trainees on using Twitter for formative course evaluation?
2. What are the factors that represent groups of trainees who share similar patterns of thoughts in the group?

## Methodology

### *Measuring Subjectivity*

Q-methodology was chosen for this study because it is a quantitative analysis of subjective data. The instrument, called Q-sample (viz., a set of opinion statements to be sorted), was developed based from the in-depth interviews. Participants, known as P-sample, sort the statements along a continuum of preference (see Figure 1). Factor analysis is used to identify the number of factors and the correlation study attempts to identify the individuals who are highly correlated with one another in each specific factor (Brown; 1993; Brown, 1994-1995; Brown, 1996).

Figure 1: Research design of the study



### Participants

The P-sample includes 39 adults ranging in age from 26 to 50 years old. All of them have full-time jobs. Twenty-two (56.4%) of the respondents were males; the other 17 (43.6%) were females. The respondents spent time online ranging from one to eight hours daily (see Table 1).

### Procedures

Twitter was applied in a Research Methodology classroom at a continuing education center of a private university in Taipei for three months in 2011. The training program, which consisted of three one hour sessions per week, was conducted in a traditional classroom; however, the formative evaluation was implemented via Twitter. The trainees attended the course on a voluntary basis. Participation in the online formative evaluation on a weekly basis was mandatory. The author involved in this project as trainer and curriculum designer. The formative course evaluation was conducted after each lecture. The trainees were asked to sent evaluation messages (i.e., the most interesting points, the most confusing points, and things want to tell/ask in each training session) via “Direct Messages” in Twitter.

### Data Collection

The research instrument was developed based on the results of the nominal group interview. The Q-sort design is with 9 piles (-4 through +4, with frequencies 2-3-3-4-6-4-3-3-2). The Q-sort design regulates the exact number of statements that a respondent can put into each pile in the continuum. Each trainee sorted 30 statements in the Q-sample according to those with which they most agree (+4) to those with which they most disagree (-4) on the sorting answer sheet (see Figure 1).

## Data Analysis

Thirty-nine trainees were interviewed and 39 Q-sorts were collected. The Q-sorts were processed and analyzed following the usual steps of Q-methodology by using the PQMethod software. Correlation, centroid factor analysis, and judgmental rotation (hand rotation) were employed to derive significant factors.

## Results

Two operant factor types were also identified: (1) Factor I: Full-Range Adopter and (2) Factor II: Twitter-Critical Adopters (see Table 1). Thirty-one of the 39 trainees' Q-sorts were divided into these two operant factors. The other eight Q-sorts were not considered to be statistically significant, i.e., loadings less than 0.36 on these two factors.

*Table 1: Factor loadings by participant and opinion type*

ID.	Gender	Age	Hours spend online daily	Rotated Factors	
				Factor I	Factor II
04	M	2	4	48	
07	F	2	5	82	
13	F	5	3	81	
15	M	5	4	57	
18	M	4	4	73	
24	F	3	2	53	
30	F	5	4	46	
37	F	4	3	52	
01	F	4	1		47
02	M	4	1		42
03	F	5	1		63
05	M	5	1		59
06	F	4	1		46
08	M	4	5		76
10	F	4	2		51
11	M	4	3		50
12	F	3	4		75
14	M	2	5		58
20	F	2	2		50
21	F	4	2		57
22	F	3	5		72
23	M	4	2		77
25	M	3	4		80
26	M	3	1		38
28	M	4	4		64

29	M	5	1	58
31	M	4	2	41
34	F	4	2	64
36	F	2	5	46
38	M	6	1	38
39	M	5	1	50

(\*) only significant loadings shown ( $p < .01$ ), decimals omitted; 8 undefined Q-sorts are not included.

M: Male; F: Female.

Age 1: 21-25 years old; Age 2: 26-30 years old; Age 3: 31-35 years old; Age 4: 36-40 years old; Age 5: 41-45 years old; Age 6: 46-50 years old.

Hours spent online daily 1: Less than 1 hour ; Hours spent online daily 2: 1-2 hours;

Hours spent online daily 3: 2-3 hours; Hours spent online daily 4: 3-4 hours; Hours spent online daily 5: above 4 hours.

### *Factor I: Full-Range Adopter*

Group I is comprised of eight participants. There are five female and three male in this group. There are seven participants (87.5% of the Group I participants) spend more than two to three hours online daily. Group I participants agreed strongly with Statement 1, Statement 2, Statement 14, Statement 15, and Statement 16; on the other hand, they disagreed strongly with Statement 18, Statement 19, Statement 27, Statement 28, and Statement 30 (see Table 2). Full-Range Adopter embraced a wide range of uses for Web 2.0 application Twitter in the classroom.

*Table 2: Statement scores by factors/opinion types*

NO	Selected Statements	Factors (*)	
		I	II
1	Because of this course, I get to know a popular social platform.	3	0
2	Twitter use limited word characters. It's brief, short, and easy to communicate.	4	-2
14	I send private message via "Direct Message" and that protects my privacy.	4	3
15	Because of the online connectivity, I am much more involved in this program.	3	-1
16	I write course reflection via Twitter in this program.	3	3
18	Twitter is less popular in Taiwan. I may not use it after this course.	-3	0
19	Some classmates ask questions just because they have to submit weekly required assignments.	-3	1

27	If I do not write the commentaries immediately, I will easily forget what types of questions should I ask.	-3	-1
28	If I didn't get the individual course feedback from the trainer, I am stressed.	-4	-1
30	Writing weekly evaluation messages is quite demanding.	-4	1

### *Factor II: Twitter-Critical Adopters*

Group II, the largest factor group extracted, is comprised of 23 participants. There are 10 female and 13 male in this group. There are nine participants (39.1% of the Group II participants) spend less than one hour online daily. Group II participants agree strongly with statement 14, statement 16, statement 17, statement 23, and statement 25; in contrast, they disagree strongly with statement 4, statement 5, statement 9, statement 10, and statement 11 (see Table 3). Twitter-Critical Adopters also saw benefits from the use of online formative evaluation, but they were highly concerned about the use of Twitter in the classroom.

*Table 3: Statement scores by factors/opinion types*

NO	Selected Statements	Factors (*)	
		I	II
4	Twitter is easier to use than E-mail an MSN.	1	-4
5	I get a change to practice English.	0	-3
8	Sometimes I cannot fully express ideas in less than 140 words.	-2	2
9	Twitter implements good web design and easy functionality.	0	-3
10	The system is stable and fast.	-1	-4
11	I have to work and I do not often have time to access to a computer.	-2	-3
14	I send private message via "Direct Message" and that protects my privacy.	4	3
16	I write course reflection via Twitter in this program.	3	3
17	Because of trainers' prompt and personal support, I feel that peer-to-peer interaction is less frequent via Twitter during the training.	-1	3
23	The instructor can modify the course on a weekly basis.	2	4
25	People who do not want to ask questions in public are less inhibited in this e-evaluation environment.	1	4

### *Consensus statements between Factor I & II*

The consensus statements between these two groups of trainees are statement 16, statement 11, statement 14, statement 22, statement 24, statement 25, and statement 26 (see Table 4).



Table 4: Consensus statements between Factor I and Factor II

NO	Statements	Factors (*)	
		I	II
16	I write course reflection via Twitter in this program.	3	3
11	I have to work and I do not often have time to access to a computer.	-2	-3
14	I send private message via “Direct Message” and that protects my privacy.	4	3
22	I feel good because of the quick response from the trainers.	2	2
24	The system maintains personal records of learning.	0	2
25	People who do not want to ask questions in public are less inhibited in this e-evaluation environment.	1	4
26	Because of the weekly e-evaluation, I am more engaged in deep personal reflections	0	1

## Discussion and Conclusion

The results of this research have illustrated the followings: (1) the findings reaffirm the importance of online formative evaluation in underpinning course pedagogy, (2) trainee opinion types can be differentiated in those who appear largely self-motivated and will likely need only minimal training interventions (Full-Range Adopters) and those who saw a wide range of uses on online formative evaluation, but were highly concerned about the use of Web 2.0 application Twitter (Twitter-Critical Adopters), and (3) Factor I and Factor II participants agreed that the integration of Twitter into the classroom enhanced learning because of critical reflections, privacy settings, online disinhibition behaviors (viz., trainees are not inhibited from self expression or seeking clarification), and prompt responses. The result closely echoes Chester and Gwynne’s (1998) findings that some of the Asian international students in the class felt more confident using computer-mediated communication instead of the face-to-face communication in traditional classrooms.

The value of Q-methodology is to reveal opinion clusters among participants who inject statements with their own understandings. The results of Q-methodology research, consequently, can be used to design various hypothesis-testing researches for future studies. Inasmuch as this study illustrates the pros and cons of the Web 2.0 application, it is concluded that implementation of Twitter for formative evaluation presents an opportunity to supplement traditional education and provides an alternative to enhance learning experiences.

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## 國科會補助專題研究計畫成果報告自評表

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

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估

- 達成目標
- 未達成目標（請說明，以 100 字為限）
- 實驗失敗
  - 因故實驗中斷
  - 其他原因

說明：

2. 研究成果在學術期刊發表或申請專利等情形：

- 論文：已發表 未發表之文稿 撰寫中 無
- 專利：已獲得 申請中 無
- 技轉：已技轉 洽談中 無
- 其他：（以 100 字為限）

This research will be published in British Journal of Educational Technology.

Chen, L. W., & Chen, T. L. (in press). Use of Twitter for Formative Evaluation: Reflections on Trainer and Trainees' Experiences. British Journal of Educational Technology. (SSCI)

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. This research offers a number of important contributions to the social networking and Web 2.0 application literature.

2. The research provides important insights to the formative and summative training evaluation literature.

3. The research provides implications and suggestions for trainers, instructional designers, and policymakers.

4. The research assistants were trained for data collection and data analysis techniques.

# 國科會補助計畫衍生研發成果推廣資料表

日期:2011/10/04

國科會補助計畫	計畫名稱: 以Q方法探討訓練學員應用Web 2.0 Twitter於形成性評鑑之認知
	計畫主持人: 陳俐文
	計畫編號: 99-2511-S-216-001- 學門領域: 應用科學教育-科學教育理論
無研發成果推廣資料	

99 年度專題研究計畫研究成果彙整表

計畫主持人：陳俐文		計畫編號：99-2511-S-216-001-					
計畫名稱：以 Q 方法探討訓練學員應用 Web 2.0 Twitter 於形成性評鑑之認知							
成果項目		量化			單位	備註（質化說明：如數個計畫共同成果、成果列為該期刊之封面故事...等）	
		實際已達成數（被接受或已發表）	預期總達成數（含實際已達成數）	本計畫實際貢獻百分比			
國內	論文著作	期刊論文	0	0	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	0	0	100%		
		專書	0	0	100%		
	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（本國籍）	碩士生	2	2	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%			
國外	論文著作	期刊論文	1	2	100%	篇	Chen, L. W., & Chen, T. L. (in press). Use of Twitter for Formative Evaluation: Reflections on Trainer and Trainees' Experiences. British Journal of Educational Technology. (SSCI)
		研究報告/技術報告	0	0	100%		
		研討會論文	0	0	100%		
		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	碩士生	0	0	100%	人次	

	(外國籍)	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						
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	成果項目	量化	名稱或內容性質簡述
科 教 處 計 畫 加 填 項 目	測驗工具(含質性與量性)	0	
	課程/模組	0	
	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	

# 國科會補助專題研究計畫成果報告自評表

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

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估

達成目標

未達成目標（請說明，以 100 字為限）

實驗失敗

因故實驗中斷

其他原因

說明：

2. 研究成果在學術期刊發表或申請專利等情形：

論文： 已發表  未發表之文稿  撰寫中  無

專利： 已獲得  申請中  無

技轉： 已技轉  洽談中  無

其他：（以 100 字為限）

This research was published in British Journal of Educational Technology.

Chen, L. W., & Chen, T. L. (in press). Use of Twitter for Formative Evaluation: Reflections on Trainer and Trainees' Experiences. British Journal of Educational Technology. (SSCI)

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. This research offers a number of important contributions to the social networking and Web 2.0

application literature.

2. The research provides important insights to the formative and summative training evaluation

literature.

3. The research provides implications and suggestions for trainers, instructional designers, and

policymakers.

4. The research assistants were trained for data collection and data analysis techniques.