

*Can Elective Course Be Used to Promote Meaningful Learning at Secondary Level?
A Study of Students' Satisfaction in School-Based Course*

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Abstract

The evolution of the traditional disciplinary curriculum was implemented by the education policy in Taiwan school curricula, at secondary level to create knowledge and understanding for the 21st century. This study was the first stage of the three-year research project supported by National Science Council of Taiwan, investigating the effectiveness of school-based elective courses in promoting students to develop core competencies and diverse ability.

A total of 17 multiple elective courses, 502 secondary level schoolgirls participated in the study. After 16-week classes in experiment, we interviewed students in depth and collected their evaluation and questionnaires. Through data analysis, the findings showed a statistically significant outcome in Teaching strategy, Learning gains, Reflective learning, and Course cognition, but except Learning attitude outcome dimensions from the survey of students' satisfaction. Participants in the planning of self-learning content and active collection of learning profile two items outcome show no significant, further from the qualitative data analysis that the class time is too short and the first contact with elective courses so that some students cannot master learning skills. But most students indicated the elective courses provided them with an opportunity to explore a wide range of subjects. This study proves that elective courses are feasible at secondary level, especially hands-on, exploratory and non-lecture courses could effectively improve students' interest in learning.

Keywords: school-based courses, core competencies in Taiwan K12 education, high school

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1. Introduction

While facing the impacts of globalization, declining birth rate, and the rapid development of digital technology, Ministry of Education in Taiwan announced the curriculum guideline of 12-year Compulsory Education in November 28th, 2014, in order to raise the quality of human resources and lay the foundations for personal and national development. The new guideline took core competencies as the main point of the whole curriculum development, focused on the coherence among different education levels and the integration among every subject.

Traditional disciplinary curriculum was undergoing changes due to the education policy, 12-year Compulsory Education, in Taiwan school curricula. The government proposed a curriculum guideline to expressly provide that high schools should open at least 6 credits elective courses which were designed to meet student's interest, aptitude, capability and need, hoping that it could broaden students' horizon, cultivate their spirit of self-directed learning, problem solving skills, critical thinking ability and teamwork ability, and furthermore, develop their core competencies.

To investigate the effectiveness of school-based elective courses in promoting students to develop core competencies and diverse ability. The present study tried to investigate what the schoolgirls' satisfaction and their needs for elective course are in TCGS. Action research was used to explore the implementation and student learning experience of TCGS diverse elective courses. The main steps are as follows.

At first, develop the curriculum design of school-based elective courses (guided by core competencies), confirm the course content and the classification, and let students choose their courses online. Next, each course goes on for 16 weeks (32 hours). Then, carry out the teacher interviews, students semi-structured interviews in the process of course and implement the survey at the end of the course. Use both quantitative and qualitative analysis to evaluate the students' learning reflections and their learning effectiveness. Then the researcher achieve a triangulation of qualitative data and verify the correctness of the results through the content of student feedback, teachers teaching reflection, and data of semi-structure interviews.

2. Literature Review

2.1 Core competencies in Taiwan K12 education

In recent years, the importance of "competencies" has been emphasized by lots of international organizations, including Organization for Economic Co-operation and Development (OECD), United Nations Educational, Scientific and Cultural Organization (UNESCO). Ministry of Education in Taiwan has announced the curriculum guideline of Twelve-year Compulsory Education in November 28th, 2014. The new curriculum guideline highlights the cultivation of "lifelong learners" and "core competencies", which means the knowledge, ability, and attitude to help students face the modern life and future challenges. A three-dimension structure of "act autonomously," "communicate interactively," and "social participation" forms the framework regarding core competencies. Under this structure there are nine themes, which are "body fitness and self-improvement, " "system thinking and problem solving, " "plan execution and creative change, " "symbol application and

communication expression, " "technology information and media literacy, " "art cultivation and aesthetic literacy, " "moral praxis and citizen consciousness, " "interpersonal relationship and teamwork collaboration, " and "multi-culture and international understanding". (Fan & Hung, 2015)

Competency is an idea consisting the knowledge, ability, and attitude of helping every individual develops into a healthy and complete person. (Tsai, 2010) The education reform in Taiwan this time hopes that student can become a lifelong learner with citizen literacy by the education of core competencies.

2.2 diverse ability

From the perspective of learning, self-directed learning remarkably influences the long-term development of the society, which means that it is not only the lifetime ability but also one of the necessary citizen literacy in twenty-first century. (Timothy et al., 2010)

Meaningful learning focuses on whether students can actively trigger their intrinsic and extrinsic motivation, which is always concerned by the researchers. (Guglielmino, 1977; Robertson, 2011; Teo et al., 2010) And self-directed learning is exactly that kind of learning ability. Moreover, Ausburn(2002), Guglielmino(1977), and Knowles(1975) separately point out that the core concept of self-directed learning comes from the autonomy, initiative, independence, and love of learning of learners. Garrison(1997) also notes that as one of the learning methods, self-directed learning can be defined as the construction of self-monitoring and self-management, the meaningful and valuable learning results. Besides, self-directed learning is a process about setting goals, analyzing missions, implementing plans, constructing and evaluating all by learners themselves. (Loyens, Magda, & Rikers, 2008; Robertson, 2011)

Self-directed learning isn't equal to independent learning. On the contrary, students need their teacher to take the responsibility of being the leader guiding them in the whole process of self-directed learning. (Robertson, 2011; Teo et al., 2010) However, teacher is no longer the controller of the classroom. In this age of knowledge-based economy, students become the center of learning and dominate their own learning. The cultivation of self-directed learning competencies is therefore the main point of the education reform in Taiwan this time, and the main content of this research as well.

3. Purpose

This study would try to answer the following research questions based on the analysis from semi-structure interviews and survey results:

- (a). Can elective course be used to promote meaningful diverse Learning in K-12 education?
- (b). What are the differences between various types of school-based elective courses in learning satisfaction and experience?

4. Methodology

4.1 Research design methods

The qualitative methods used in the study were observation, semi-interview and documents analysis from student feedback. For both teachers and researchers involved in this study, the most important task has been to report and document the research experiments and findings as thoroughly as possible by providing detailed descriptions of the ideas of choosing the elective course and learning harvesting by the schoolgirls. The purpose of data collection has been to create an embryonic form of the way schoolgirls choose their elective course.

Integrating action research and the evaluation of case study designs is often used to assess and explain the results of specific interventions which have been implemented in a real-life context (Yin, 1993). A case study of action research design was used to provide evidence regarding answers to the questions of this paper.

As we aimed to investigate whether elective course be used to promote meaningful diverse learning in K-12 education and the different learning experience between various types of school-based elective courses, we adopted an exploratory case study methodology. Students' learning worksheets, self-reflection records, final report and semi-structured interview were analyzed qualitatively to provide insight into the empirical findings. A survey of the learners' degree of learning satisfaction and experience was implemented to the students after the elective courses was finished. Using both quantitative and qualitative methods helps triangulate results from diverse data sources. Within mixed methods the researchers can inspect those different and overlapping facets of phenomenon, discover paradoxes, contradictions, and new perspectives, and expand the scope and breadth of a study (Tashakkori & Teddlie, 2003).

4.2 Participants

Teachers

The course of this study was a total of four major categories of 17 courses, a total of 30 teachers to provide and teach. Each course was developed by teachers in a single or cross-domain cooperation according to course objectives. Teachers were proficient at course content, including high school teachers and university lecturers.

Students

Participants of this study were five hundred and one 10th graders, all females, from 14 classes in a local high school in Taiwan. Their average age was 16, and their educational experiences were similar. T-tests showed that the academic performance of each class was not different ($p > 0.1$). According to the participants' choice, they were assigned to 21 classes.

4.3 Research procedure and Data analysis

To explore the participants' perceptions of their learning satisfaction & experience in elective course, both quantitative and qualitative data were collected and analyzed. Qualitative data of this research project included learning experience feedback records and semi-structured interviews with open ended questions in order to understand the student's comments about the elective course.

The learners' degree of satisfaction & experience questionnaire consisted of five aspects namely: "teaching strategy", "learning attitude", "peer interaction", "learning gains", and "course cognition", which had 6, 6, 5, 5, and 6 questions respectively. A five-point Likert scheme was used to rate the questionnaire items (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). The instrument constructed was validated by experts in curriculum design. The Cronbach's alpha values of the five dimensions were 0.87, 0.86, 0.87, 0.87 and 0.95, and the overall Cronbach's alpha value was 0.96.

At week 17 of the course, all participants were encouraged to answer the questionnaire as honestly as possible, as there were no right or wrong answers and they were informed about the confidential and anonymous treatment of their responses to the survey.

For quantitative data analysis, we adopted descriptive statistics analysis method to analyze assessment of learners' degree of satisfaction & experience, an independent sample t-test was used in this research, test value was 3.5 which was then used in analyzing each question and compare with 3.5 to determine whether it had reached significant level. At last, we described the relation among each variable. And further with the qualitative research data, we tried to explain whether the elective courses could promote student diversity learning. And to answer research question two, a one-way analyses of variance (ANOVA) was conducted among the four type course using the survey data.

4.4 Data reliability and validity

In order to promote the quality and credibility of the study, according to Lincoln and Guba (1985) have proposed to increase the reliability indicators: credibility, migration, reliability and verifiability. In-field observation, analysis of participants' group-discussion records, four times semi-structure interviews and final report of each group' project work were employed in the study to achieve a triangulation of qualitative data.

4.5 School-based elective courses in TCGS

The elective courses in the study were classified into four major categories of 17 courses as follow.

Type 1: Language Learning

Type 2: Mathematics, Physics Advanced Learning

-Traditional lecture teaching, group cooperative learning

Type 3: Interdisciplinary / hands-on courses

Type 4: Humanities and Arts courses
 -Hands-on activity, group activity, explore teaching

Table1.

Type 1: Language Learning	Number of student	Total
Second Foreign Language - Japanese(basic)	76	190
Second Foreign Language - French(basic)	39	
Second Foreign Language - Spanish(basic)	41	
Second Foreign Language - German(basic)	20	
Basic English Creation	14	
Type 2: Mathematics, Physics Advanced Learning		
Mathematics Exercises	20	90
Pre trigonometric	26	
Mathematical Modeling	15	
Digitized Physical Mechanics Experiment	29	
Type 3: Interdisciplinary / hands-on courses		
The X-files of Earth Science	22	127
Ocean Mysterious Treasure	15	
Robots Creative Topics	21	
Fashion Grand Tourday Group of Players	36	
Biology	33	
Type 4: Humanities and Arts courses		
Reading Media	24 /2	60
Creative Painting Performance	19 /2	
English Picture Book Creation	17 /1	

5. Result and Discussion

5.1 Quantitative analysis

5.1.1 The analysis of learning satisfaction and experience (descriptive statistics)

Aiming at the analysis of curriculum satisfaction and experience which proceeded in 18th week for all classes, we found out that the average score for the satisfaction of entire course was 3.88, the average score of each dimension as shown in Table1. Teaching strategy was 4.05, learning attitude was 3.55, peer interaction was 4.92, learning gains was 3.97, and course cognition was 3.94. According to the result above, we could know students obtained lower scores in learning attitude and peer interaction, and learning attitude dimension was not significantly in t-test($\mu > 3.5$) result.

Table2. Descriptive statistics for all classes

dimension	M	S.D.	t ($\mu > 3.5$)
Teaching strategy	4.05	0.79	15.56***
Learning attitude	3.55	0.80	1.42
Peer interaction	3.92	0.79	11.81***
Learning gains	3.97	0.81	12.87***
Course cognition	3.94	0.94	10.52***
Tol.	3.88	0.74	11.69***

N=501, test value=3.5, *P<.05, **P<.01, ***<.001

5.1.2 Difference between the various types of courses

Research question two was to investigate whether the differences between various types of school-based elective courses in learning satisfaction and experience. To answer this question, a one-way analysis of variance (ANOVA) was conducted among the survey data from the students of 21 classes. And results was as table 4.

Table 4 shows univariate ANOVA results for each dependent variable. The univariate ANOVAs for teaching strategy, learning attitude, peer interaction, learning gains, and course cognition were significant ($p < .05$). Furthermore, post hoc analysis was performed to examine specific differences in each dimension between the 4 Type course, and described the results as follow.

Teaching strategy:

The ANCOVA result shows that the teaching strategy of the four groups were significantly different ($F(3,466)=10.74$, $p<.001$). Furthermore, post hoc analysis was performed to examine specific differences in achievement between the four groups. Type 1 was significantly higher than Type 2, Type 3 was significantly higher than Type 2, Type 4 was significantly higher than Type 2. It is therefore concluded that the Type1, Type3 and Type 4 course had a significant accept than Type2 on teaching strategy in the elective courses.

Learning attitude:

The ANCOVA result shows that the learning attitude of the four groups were significantly different ($F(3,466)=8.92$, $p<.001$). Type 3 is significantly higher than Type 1 & Type 2, Type 4 is significantly higher than Type 1 & Type 2. It is therefore concluded that the Type3 and Type 4 course had a significant change on learning attitude in the elective courses.

Peer interaction:

The ANCOVA result shows that peer interaction of the four groups were significantly different ($F(3,466)=3.79$, $p<.05$). Type 4 is significantly higher than Type 2, and there is no other significant difference between other types of courses

Learning gains:

The ANCOVA result shows that learning gains of the four groups were significantly different ($F(3,466)=11.89$, $p<.001$). Type 1, 3, 4 are significantly higher than Type 2 individually. It is therefore concluded that the Type1, Type3 and Type 4 course had a significant accept than Type2 on learning gains in the elective courses.

Course cognition

The ANCOVA result shows that course cognition of the four groups were significantly different ($F(3,466)=17.86$, $p<.001$). Type 1, 3, 4 are significantly higher than Type 2 individually. It is therefore concluded that the Type1, Type3 and Type 4 course had a

significant accept than Type2 on course cognition in the elective courses.

Overall, the result is significantly different ($F(3,466)=11.75$, $p<.001$). Type 1, 3 are significantly higher than Type 2. Type 4 is significantly higher than Type1 & 2.

Table3. Descriptive statistics for all type course

dimension	Type of course	Total	M	S.D.
Teaching strategy	(1)	190	4.05	0.78
	(2)	90	3.70	0.90
	(3)	127	4.20	0.68
	(4)	60	4.35	0.70
Learning attitude	(1)	190	3.44	0.77
	(2)	90	3.41	0.88
	(3)	127	3.74	0.77
	(4)	60	3.92	0.72
Peer interaction	(1)	190	3.89	0.75
	(2)	90	3.79	0.85
	(3)	127	4.02	0.75
	(4)	60	4.18	0.83
Learning gains	(1)	190	3.99	0.77
	(2)	90	3.58	0.91
	(3)	127	4.17	0.73
	(4)	60	4.22	0.80
Course cognition	(1)	190	4.00	0.89
	(2)	90	3.39	1.01
	(3)	127	4.22	0.82
	(4)	60	4.24	0.84
Overall	(1)	190	3.87	0.71
	(2)	90	3.58	0.83
	(3)	127	4.07	0.65
	(4)	60	4.18	0.69

Table4. One-way ANCOVA summery table for effects of the types of courses

Dimensions	source	SS	DF	MS	F	Post hoc comparisons
Teaching strategy	Between groups	19.15	3	6.38	10.74***	(1) > (2)
	Within groups	275.13	463	0.59		(3) > (2)
						(4) > (2)
	Total	294.28	466			
Learning attitude	Between groups	16.53	3	5.51	8.92***	(3) > (1)
	Within groups	285.96	463	0.62		(3) > (2)

	groups					(4) > (1)
	Total	302.49	466			(4) > (2)
Peer interaction	Between groups	6.93	3	2.31		
	Within groups	282.52	463	0.61	3.79*	(4) > (2)
	Total	289.46	466			
	Between groups	22.33	3	7.44		(1) > (2)
Learning gains	Within groups	289.81	463	0.63	11.89***	(3) > (2)
	Total	312.14	466			(4) > (2)
	Between groups	42.33	3	14.11		(1) > (2)
	Within groups	365.84	463	0.79	17.86***	(3) > (2)
Course cognition	Total	408.17	466			(4) > (2)
	Between groups	18.06	3	6.02		(1) > (2)
	Within groups	237.12	463	0.51	11.75***	(3) > (2)
	Total	255.18	466			(4) > (1)
Overall	Within groups	255.18	466			(4) > (2)

*p<.05, **p<.01, ***p<.001

5.2 Qualitative analysis

Based on the semi-structured interview data, qualitative analysis and the learning satisfaction and experience questionnaire, the results of the inferential statistics could be interpreted as followed:

1. Generally speaking, students enjoy the multicultural experience and content in the language learning courses.
2. "Teamwork and communication skills are promoted." is the most general feedback, especially from the students in Type 3 & Type 4 courses.
3. Most of the students believe that their learning attitude are positive and active because they choose the courses they are interested in.
4. Students in Type 2 courses consider that teachers go too fast, the contents are too difficult, and they play a passive role in the classroom. The feedback correlates to the results of the statistical analysis. (in the teaching strategy, learning gains, and course cognition part)
5. Hands-on activity can make learning not only much more interesting but also closer to students' life.
6. Students hope that school can also offer elective courses in 11th grade.
7. Teachers should focus on the process evaluation instead of test scores or group scores.

6. Conclusions

This paper reports on the elective courses in 11th grade, over 18 weeks, exploring its effectiveness on participants' learning and learning attitudes established during the learning experience. According to the experimental results and discussion, the following conclusions are suggested.

1. The elective course design should be student-centered.

The traditional teacher-centered teaching strategy was helpless than student-centered in changing students' learning attitude. Thinking outside the box, letting students be the center of learning, and developing school-based elective courses can help students adapting to modern life and develop core competencies for the future.

2. Use different teaching strategies to activate teaching content is important in elective course.

For example, even though the lecture teaching strategy is used in the language learning courses, by integrating public issue, culture appreciation, and hands-on activity, it can still make students interested in learning languages.

3. The interdisciplinary & hands-on courses can promote student attitudes.

In the interdisciplinary & hands-on courses, students' learning attitude are significantly changed due to the communication and cooperation with peers. Moreover, the courses meet students' needs, too.

4. Elective course can broaden students' horizons and make them interested in learning.

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