

the iafor

journal of education

Volume III - Issue I - Winter 2015

Editor: Bernard Montoneri



ISSN: 2187-0594

iafor

The IAFOR Journal of Education
Volume III – Issue I – Winter 2015

IAFOR Publications

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The IAFOR Journal of Education

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Published by The International Academic Forum (IAFOR), Japan
IAFOR Publications. Sakae 1-16-26-201, Naka-ward, Aichi, Japan 460-0008
Executive Editor, IAFOR Publications: Joseph Haldane
Editorial Assistance: Lindsay Lafreniere
Design: Bernard Montoneri

The IAFOR Journal of Education
Volume 3 – Issue 1 – Winter 2015

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ISSN: 2187-0594 (Online) <http://iafor.org/educationjournal.html>

Cover image by: Jason Weaver/Flickr
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Introduction

It is my great pleasure and honour to introduce Volume 3, issue 1 of IAFOR Journal of Education. This issue is a selection of papers submitted directly to our journal as well as studies presented during:

1. The Sixth Asian Conference on Education and The Second Asian Conference on Society, Education & Technology, ACE & ACSET 2014, "Transforming and Changing Education: Individuals, Communities, Societies", held in Osaka in October-November 2014. 567 abstracts were submitted, 473 were accepted (305 presentations).
2. The European Conference on Technology in the Classroom 2014 (ECTC2014). The conference held in Brighton, UK, in July 2014.

Education in the 21st century

Our journal is proud to introduce scholars from all over the world. Most of the studies presented in this issue discuss the application of various systems, platforms and tools to improve teaching and learning in the classroom and/or as a complement to the class. Richard Mather discussed the use of a Learning System Platform for Computer Programming at Buckinghamshire New University, England. Balla et al. presented a self-developed interactive blind map teaching-examining e-learning system at the University of Debrecen, Hungary. Chin et al. evaluated students' writing performance in Singapore using a Wiki platform. Montoneri used a Facebook learning group in Taiwan to analyze the impact on students' grades and motivation as well as on the teacher's evaluation. Balmeo et al. determined the effectiveness of the National Service Training Program (NSTP) for the students, its influences along self-improvement, performance, community involvement, and demonstration of abilities and skills, and the difficulties encountered by the students at Saint Louis University, in the Philippines. Sokolowski's research included only peer-reviewed studies published in journals between 2000 and 2013 concerning high school and college math courses. A total of 13 primary studies were used in this meta-analysis with a total of 1,670 participants. As to Ilana Ronen and Tal Shemer-Elkayam's study, it dealt with student teachers participating in five learning communities in Israel. Walk et al. examined kindergarten English language outcomes in classrooms containing monolingual English speaking children and bilingual children who speak English and one other language in various schools in the US. Huang et al. investigated the current status of the international perspectives of and the differences between sixth graders in Taipei and Shanghai. And finally Brenda used two Flipped Classroom approaches to stimulate deep learning in large classrooms during the teaching of a film module as part of a Diploma in Performing Arts course at Sunway University, Malaysia.

The first paper is authored by Richard Mather ("Multivariate Gradient Analysis for Evaluating and Visualizing a Learning System Platform for Computer Programming"). This study concerns a method for exploring the type of multivariate data that is commonly encountered when researching information-rich learning spaces. Here canonical gradient analysis is evaluated for its effectiveness in revealing relationships between student progress, collaboration and acceptance of a game-like environment for learning computer programming. The study establishes that the approach clearly and visually demonstrates behaviours that are most strongly associated with subject understanding and assessment success. On this occasion the method exposes high levels of acceptance of the collaborative learning environment, but an unexpectedly weak relationship between course assessment and programming ability. Such findings are easily interpretable and usefully guide teaching practice.

The second paper is co-authored by Dániel Balla, Marianna Zichar, Judit Boda, and Tibor József Novák ("Control grouped pedagogical experiment to test the performance of second-generation web maps and the traditional maps at the University of Debrecen"). They present a self-developed interactive blind map teaching-examining e-learning system of the University of Debrecen and compare two similar groups of students. Balla et al. show that the performance of the students in the experimental group using the new digital environment to study was better than in the control group using paper maps in the traditional way, but unfortunately the difference is not significant enough to prove that the better results are related to the new method and that its applications would lead to better results. Very high familiarity with the real regional geography is necessary for students to be able to enhance their knowledge successfully without distortion.

The third paper is co-authored by Chee Kuen Chin, Cheng Gong, and Boon Pei Tay ("The Effects of Wiki-based Recursive Process Writing on Chinese Narrative Essays for Chinese as a Second Language (CSL) Students in Singapore"). They analyze the impact of using a Wiki platform on students' overall writing performance. It was discovered that students' quality of written products was improved and that students benefited the most from giving remarks to their peers' writing. Feedback they gave and received not only enhanced their exposure to the target language but provided more opportunity for critical thinking. Students with higher language levels tend to examine the theme first and then the suitability of the materials or coherence of the contents. Students with lower language levels tend to focus more on surface errors like grammar and word collocations. Students need to be taught and equipped with necessary knowledge and skills to assess their peers' written work via wiki platform. Without proper prior training, students will not be able to perform peer review in the virtual environment.

The next paper, written by Bernard Montoneri ("Impact of Students' Participation to a Facebook Group on their Motivation and Scores and on Teacher's Evaluation"), shows that, in a class of European Literature, in a department of English in Taiwan, students who joined a secret Facebook learning group saw their motivation increase. This paper compared traditional teaching during the first semester with using Facebook as a complement to the class during the second semester. It appears that students followed regularly and seriously all the posts from February to June 2014. Students' grades improved during the second semester as well as teacher's evaluation by the students. This project also shows what type of posts students prefer (pictures, links, PPT files, songs, videos related to the class) and when each type of posts should be shared for better efficiency.

The fifth paper is co-authored by Marilyn L. Balmeo, Jeffry P. Falinchao, Kathleen Kaye L. Biay, Joyce Karen M. Ebes, Julienne G. Eclarino, and Ivy Gail P. Lao-ang ("The effects of NSTP on the lives of Saint Louis University students"). They discuss the effectiveness of the National Service Training Program (NSTP) for the students, its influences along self-improvement, performance, community involvement, and demonstration of abilities and skills, and the difficulties encountered by the students, such as financial problems, going to the assigned classroom, obtaining the signatures of authorized signatories, managing time wisely, and adapting to non-permanent instructors. The instruction was effective and it addressed the leadership skills needed by the students. Through effective community service provided by the NSTP courses, students developed holistically as individuals, as students, and as responsible citizens.

The next paper, written by Andrzej Sokolowski ("The Effects of Mathematical Modelling on Students' Achievement-Meta-Analysis of Research"), shows that mathematical modeling plays an important role to help students comprehend abstract math ideas through contextualization. Can mathematical modeling be used as a platform to link mathematical apparatus with scientific inquiry methods? Andrzej meta-analyzed the effects of applying mathematical modeling in high

school and college levels globally and suggested venues to merge the methods of mathematics and science during modeling processes.

The seventh paper is written by Ilana Ronen and Tal Shemer-Elkayam ("Enhancing Community Service Learning Via Practical Learning Communities"). The research examines the contribution of a learning community to enhancing student teachers' responsibility and their social involvement. The findings pinpointed that there were positive contributions of the learning communities from a personal aspect such as developing self-learning, and learning about "me", as well as broaden their teaching skills, through methodology for teacher training, and developing reflective thought. The topics discussed in the learning communities enabled a variety of ideas and thoughts, the positions and attitudes of each participant in an atmosphere of respectful discussion allowed for various solutions and appreciation of the process.

The next paper is co-authored by Anne Walk, Hisako Matsuo, and Alex Giovanoni ("Preschool Predictors of Kindergarten Language Outcomes"). They examine kindergarten English language outcomes in classrooms containing monolingual English speaking children and bilingual children who speak English and one other language. Data coming from the National Center for Early Development and Learning Multistate Study of Pre-Kindergarten (2001-2003) demonstrate that social variables were important for both monolingual and bilingual children. Personality variables were more predictive for monolingual children, whereas teacher relationship variables were more important for bilingual children.

The ninth paper is co-authored by Yueh-Chun Huang, Huan-Hung Wu, and Yu-Liang Chang ("A Comparative Study of the International Perspectives of Six-Graders in Taipei and Shanghai"). This paper helped educational practitioners obtain a clear picture regarding to what degree primary school students possess international perspectives. Most importantly, the significance of this paper lies in its contribution of comparing the international perspectives between mainland China and Taiwan. Mainland China and Taiwan have shared the same culture and ethnicity, yet were separated for more than sixty years. This paper developed a questionnaire to investigate the current status of the international perspectives of and the differences between Six-Graders in Taipei and Shanghai. A total of 1,300 Six-Graders were randomly stratified from the two cities, significant differences of their demographic characteristics were also identified.

The last paper is written by Brenda Danker ("Using the Flipped Classroom Approach to Explore Deep Learning in Large Classrooms"). Brenda used two Flipped Classroom approaches to stimulate deep learning in large classrooms during the teaching of a film module as part of a Diploma in Performing Arts course at Sunway University, Malaysia. Data was gathered from questionnaires filled out by the students and from short interviews with the students, as well as from the teacher's reflective journals. The findings verified that the flipped classrooms were able to remodel large lecture classes into active-learning classes. The results also support the possibility of individualised learning for the students as being high as a result of the teacher's ability to provide one-on-one tutoring through technology-infused lessons.

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The aim of this special issue is to discuss issues and address the challenges of using emerging technologies in learning and teaching. Additionally it will attempt to answer different questions regarding the impact of emerging technologies adoption in instructional activities, and will present cases from different fields and applications.

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Multivariate Gradient Analysis for Evaluating and Visualizing a Learning System Platform for Computer Programming

Richard Mather

Abstract

This paper explores the application of canonical gradient analysis to evaluate and visualize student performance and acceptance of a learning system platform. The subject of evaluation is a first year BSc module for computer programming. This uses 'Ceebot', an animated and immersive game-like development environment. Multivariate ordination approaches are widely used in ecology to explore species distribution along environmental gradients. Environmental factors are represented here by three 'assessment' gradients; one for the overall module mark and two independent tests of programming knowledge and skill. Response data included Likert expressions for behavioral, acceptance and opinion traits. Behavioral characteristics (such as attendance, collaboration and independent study) were regarded to be indicative of learning activity. Acceptance and opinion factors (such as perceived enjoyment and effectiveness of Ceebot) were treated as expressions of motivation to engage with the learning environment. Ordination diagrams and summary statistics for canonical analyses suggested that logbook grades (the basis for module assessment) and code understanding were weakly correlated. Thus strong module performance was not a reliable predictor of programming ability. The three assessment indices were correlated with behaviors of independent study and peer collaboration, but were only weakly associated with attendance. Results were useful for informing teaching practice and suggested: (1) realigning assessments to more fully capture code-level skills (important in the workplace); (2) re-evaluating attendance-based elements of module design; and (3) the overall merit of multivariate canonical gradient approaches for evaluating and visualizing the effectiveness of a learning system platform.

Keywords: Technology Enhanced Learning; Computer Programming; Research Methods; Multivariate Analysis.

Introduction

The two aspects of the study reported below concern: (1) the educational context, in this case an investigation of an approach for learning and teaching computer programming; and (2) the primary objective, an evaluation of a novel means for exploring complex data that commonly arise from such multivariate studies. Regarding the first aspect (the approach taken for introducing programming), it is widely accepted that students find that learning to programming is challenging and an obstacle to progression to later stages of higher education. The paper “Learning and Teaching Programming: A Review and Discussion” by Robins and co-workers (2003) at Otago University, clearly summarizes that “Novice programmers suffer from a wide range of difficulties and deficits. Programming courses are generally regarded as difficult, and often have the highest dropout rates”.

Experiences at Buckinghamshire New University, where modules in programming underpin computing courses, reflect the findings of Robins *et al.* (*ibid.*) and of others reporting student difficulties in understanding both introductory and higher level programming concepts (for example Milne and Rowe, 2002).

Many learning and teaching applications therefore endeavor to make the subject less intimidating and more accessible to novice programmers through creative use of graphical and interactive development environments or immersive game-like interfaces. Widely used examples of such learning environments include: Alice (Cooper *et al.*, 2000); Lego Mindstorms (Barnes, 2002); BlueJ (Kölling *et al.*, 2003), Greenfoot (Henriksen & Kölling, 2004) and Scratch (Resnick *et al.*, 2009). In this study, students use the Ceebot application, designed for learning industry-standard C-language syntax and object-oriented principles (Huber, 2008; Maragos & Grigoriadou, 2005). Ceebot employs a dynamic landscape populated with robotic devices that may be programmed to interact with each other, ‘alien’ life and to perform tasks on inanimate objects (see Figure 1).

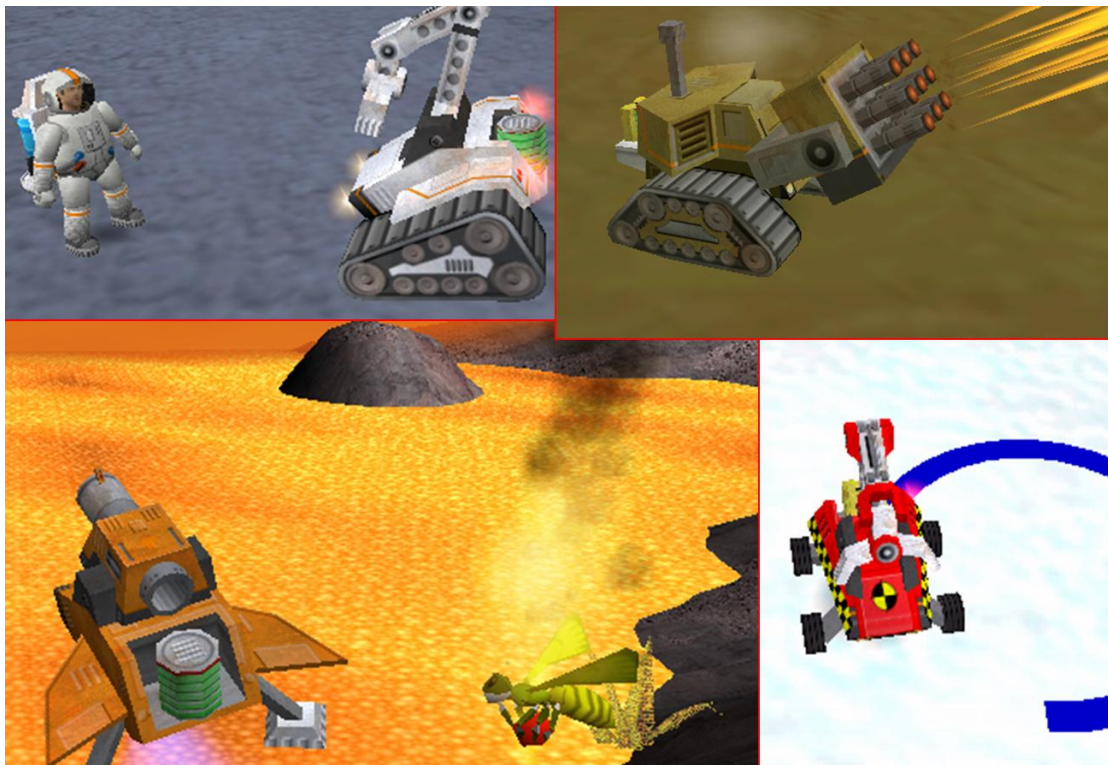


Figure 1. Screen capture from Ceebot showing a small section of ‘bots’ that may be programmed to move, pick up objects, shoot, fly (bottom left) and draw (bottom right).

Concerning the second aspect of research interest (the means of data analysis), the nature and type of data available is normally determined by the intention of research, the context, the research style and strategy for data collection and analysis (Cohen, Manion and Morrison, 2011). As with many exploratory investigations surrounding the efficacy and acceptance of educational environments, data sets are often unavoidably complex and multivariate as a consequence of response behaviors, potential explanatory variables and interaction effects. Moreover, in exploratory analyses involving questionnaire data, it may be desirable to first screen or filter variables for explanatory power and for collinearity or other redundancy (Cohen, Manion and Morrison, *ibid.*).

Common exploratory approaches include correlation analysis (Pearson's Product Moment Correlation coefficient and Spearman's Rank Order Correlation coefficient). Although strictly concerned with bivariate relationships both are often used in matrices to explore patterns in multivariate data (Sokal and Rohlf, 1995).

Among gradient-type tools, Principle Component Analysis (PCA) is a true multivariate tool that is widely used for exploratory purposes. Although a useful means for investigating multivariate relationships, the ordination axes describing variation only represent orthogonal directions in the entire data set and are not directly related to explanatory data (Sokal and Rohlf, *ibid.*).

Similar to PCA, the alternative approach of Canonical Correspondence Analysis (CCA) has the advantage that response scores are regressed on explanatory data, so ordination axes are constrained to explanatory variables. Canonical gradient analysis techniques are widely used by the ecology scientific community. Correspondence analysis (CA) was pioneered by ecologists from the 1970s and found to be well suited to describing unimodal species distributions. Canonical Correspondence Analysis (CCA) was developed by ter Braak for ecological sciences (ter Braak, 1986) and is highly regarded by community ecologists for investigating the distribution and abundance of species along environmental gradients (Šmilauer and Lepš, 2014).

However, CCA assumes unimodal distribution of response variables and is insensitive to direction of relationship. Thus this study evaluates Redundancy Analysis (RDA), first publicized by van den Wollenberg in 1977. RDA possesses two advantages that ordination axes are constrained to explanatory variables and, through applying a linear ordination, does not rely on assumptions of unimodality. It is, in effect, the canonical equivalent of PCA (ter Braak, 1987). Like CCA, RDA is a valued tool among ecologists and environmental scientists. CCA and RDA may also be used in a 'partial' form to filter effects of background variables so that residual variation may be analyzed against explanatory factors of interest. One example of this being a study of forest condition in which relationships with atmospheric pollution were analyzed after first 'removing' variation in data sets attributable to meteorological effects (Mather *et al.*, 1995).

Aim and objectives

The primary intention of this investigation is to evaluate a Redundancy Analysis as a multivariate statistical tool for exploring student engagement and performance in a learning environment. As a consequence, this fulfilled a secondary aim of revealing interrelationships between student behaviors, preferences and achievement using the Ceebot environment for learning computer programming.

Method

First year degree students enrolled on courses in computing, games development and software engineering and attending a module on introductory computer programming were invited to participate in this study. Of a possible eighty students thirty five made fully valid returns (no

missing data) for a questionnaire with a combined test and also completed the final module assessment.

The combined test and questionnaire comprised: (1) a self-evaluation of perceived difficulty; (2) tests of commonly used terms/definitions and of code skill and understanding; and (3) twenty questions with Likert scale responses (see Table 1) designed to gauge individual acceptance of the Ceebot environment, preferences, behaviors and approaches to completing work. Likert scales intentionally allowed neutral responses.

Two further variables for module mark and attendance (both as percentages) were included for each student record.

Measures were taken to ensure that participants were willing and consented to recordings. The reasons for study, the ownership, protection and the distribution of information were clearly explained. All findings are published anonymously.

Questionnaire returns were subjected to checks for completeness, accuracy and uniformity, following established recommendations of Moser and Kalton (1977). Data were collated in spreadsheets and, for purposes of canonical analyses with the Canoco 5 application (ter Braak and Šmilauer, 2012), divided into response and explanatory data. Although other statistical packages allow canonical analysis, Canoco 5 was selected for reasons of a dedicated canonical specification that is subject to ongoing research and development. It also offers powerful graphing tools for visualizing ordinations (Šmilauer and Lepš, *op. cit.*).

Although a conventional approach might perhaps be to regard that module grades and test scores were ‘responses’ to predisposing explanatory variables (e.g. motivation, attendance, collaborative inclination, as indicated by questionnaire data), in initial analyses RDA axes were constrained to the key learning performance indices of interest. In other words module grades and test scores were initially reversed to become explanatory variables and questionnaire data became response variables.

Reasons for adopting this ‘switched’ perspective included that module grades and test results were more representative of true gradients than the limited range of Likert categories. There were also a relatively large number of questionnaire variables for which, in the context of this exploratory study, it was highly probable that many would be unrelated to the learning performance variation of interest. In addition to potentially weak explanatory power, there was also a strong likelihood that much questionnaire variation was intercorrelated and collinear.

Given the landscape ecology origins of canonical and redundancy analysis (in which species and other biological variation is commonly investigated against explanatory environmental gradients, there was also conceptual consistency in this converse view. Thus learning achievements (as indicated by grade and test results) represented positions along gradients in a learning landscape; these positions being in part determined by behaviors, preference, acceptance characteristics.

Results and Discussion

Central tendency in questionnaire responses

Initial screening for central tendency in questionnaires (Table 1) revealed only one item in which the overall response pattern was entirely symmetrically distributed around a neutral mode (Question 18 in Table 1). For all other questions Likert distributions were clearly skewed towards either agreeing or disagreeing to the assertion made. Overall consistent ‘polarities’ between similar but alternative viewpoints concerning acceptance of Ceebot (e.g. questions 3, 5, 6, 9, 11

and 13) and motivation (e.g. questions 10, 12, 16, 17, 19 and 20), suggested that questionnaires had been completed accurately and diligently.

Table 1. Summary of frequency of Likert category against questionnaire returns

Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. It is very helpful to discuss Ceebot problems with friends.	<u>21</u>	13	0	1	0
2. It is always possible to find information to complete exercises.	3	11	<u>14</u>	4	3
3. Ceebot animated environment aids understanding.	10	<u>16</u>	7	2	0
4. I find it useful to draft designs and algorithms on paper.	1	12	<u>13</u>	4	5
5. Ceebot does not help me remember fundamental concepts.	0	7	3	<u>19</u>	6
6. Ceebot is enjoyable.	6	<u>20</u>	8	1	0
7. No formal lectures are required – just Ceebot notes.	2	7	6	<u>18</u>	2
8. Like this module to be commercially recognised qualification.	5	<u>18</u>	8	4	0
9. Ceebot graphics are distracting.	2	2	7	<u>19</u>	5
10. Un-assessed multiple-choice tests would help with learning.	3	<u>19</u>	10	3	0
11. It would be quicker to learn to program without Ceebot.	2	8	10	<u>11</u>	4
12. Easiest way to complete logbooks is to cut and paste code.	5	<u>14</u>	11	3	2
13. Ceebot is good for learning C-programming for employment.	7	<u>22</u>	6	0	0
14. Other websites are helpful for completing exercises.	0	4	6	<u>18</u>	7
15. I'm worried that Ceebot may not help me get a job.	2	6	<u>12</u>	10	5
16. I only work on Ceebot exercises in practical sessions.	1	2	4	<u>21</u>	7
17. 2+ hours extra work is needed to complete the week's tasks.	7	<u>22</u>	1	5	0
18. More exercises than needed to understand concepts covered.	1	9	<u>15</u>	9	1
19. I work on Ceebot exercises at home.	14	<u>17</u>	2	2	0
20. I'd like an e-forum to discuss Ceebot problems.	14	<u>15</u>	4	2	0

Table 1 Notes: (1) mode category is bold and underlined; (2) questions are abbreviated from full questionnaire form for the purposes and convenience of tabular display.

The interpretation of redundancy analyses and ordination diagrams

The ordination diagrams presented in Figures 2 and 3 are correlation biplots in which axes are scaled to unit length and increment (ter Braak, 1992; Šmilauer and Lepš, *op. cit.*). Response variables are represented by blue arrows (or vectors) and explanatory variables are represented by red arrows. The length of arrows is proportional to their standard deviations and the cosines of their angular separations between each other and the axes (regardless of whether explanatory or response variables) corresponds to their correlation coefficients, i.e. $r \approx \cos \Theta$ (Corsten and Gabriel, 1976; ter Braak, 1987; Šmilauer and Lepš, *op. cit.*). Thus perpendicular relationships between response and explanatory arrows and axes (i.e. approximating to cosine 90°) indicate near zero correlation ($r \approx 0$) while parallel relationships (whether in same or opposing directions) represent correlations approaching unity ($\cos 0^\circ$ or 180° corresponding to $r=1$ or -1 respectively).

Summarizing, the heads of arrows indicate the direction of maximum variation in the value of corresponding variable. The longer an arrow the greater the importance of the variable effect in the model and also the greater the confidence in the inferred correlation (ter Braak, 1987; ter Braak and Prentice, 1988). Variable arrows and ordination axes in the same direction are positively correlated, perpendicular vectors are not correlated and those pointing in opposing directions are negatively correlated.

It is important to note that a 180° shift in correlation polarity may simply reflect that a questionnaire item is expressed with a negative rather than a positive assertion.

In tables of summary statistics (Tables 2 and 3) entries are only made for the first two axes because these describe the great majority of explainable variation in response data. The first row states eigenvalues. These express the proportion of all variation (unity) explained by an axis; hence their equivalence to percentage expressions for cumulative variation on the second row. The pseudo-canonical correlations on the third row express the correlation between response based and explanatory-variable based axes (Šmilauer and Lepš, *op. cit.*). The final entries for explained fitted variation are only concerned with variation described by the model and express the proportion explained by the axis concerned.

Notes following summary statistic tables describe: (1) the total response variation explained by explanatory variables and an adjusted figure to compensate for inflatory bias due to small sample sizes (Šmilauer and Lepš, *ibid.*); and (2) a pseudo- F statistic is derived and may be interpreted in the same way as in ANOVA of the regression model (Šmilauer and Lepš, *ibid.*). The probability P is derived from a Monte Carlo permutation test. This involves random permutation of response data with respect to explanatory variables. Thus, if after 999 permutations, 43 random permutations produced eigenvalues greater than that for the original data, P would be $(43+1) / (999+1) = 0.044$.

Findings from Exploratory Redundancy Analyses

The result of redundancy analysis of all data (using the 'converse' view that grade and test achievement variables represented gradients that explained distributions of behaviors, preference, acceptance responses) is represented by the ordination of Figure 2, with summary statistics presented in Table 2.

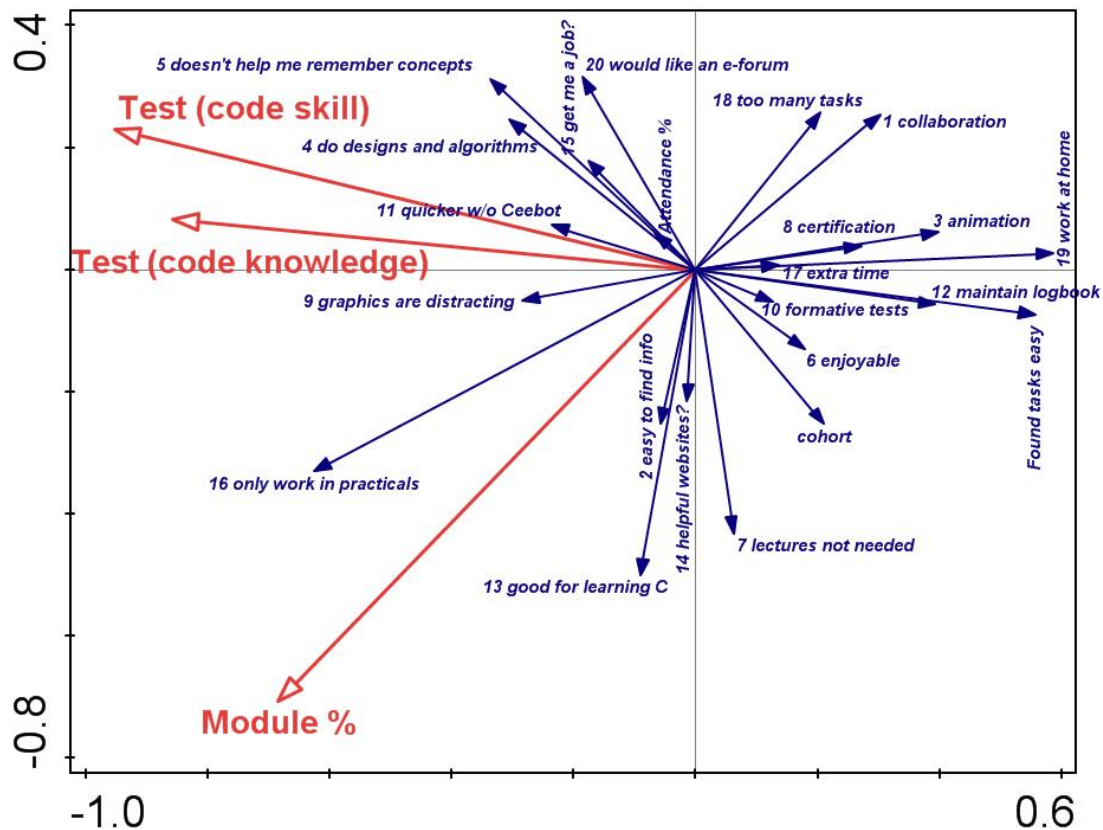


Figure 2. Ordination Biplot for the Redundancy Analysis of student behaviors, preference, acceptance responses (as indicated by blue arrows representing questionnaire returns and class attendance) against positions along learning performance gradients (as indicated by red arrows indicating module grade and tests of programming knowledge and coding skill).

The first (horizontal) axis describes most variation in response variables at approximately 9% (Table 2 eigenvalue 0.0915 and cumulative percentage 9.15%). The direction and length of the two “Test (code ...)” vectors indicate their overall influence on the first axis and relative effectiveness in describing the greater proportion of explainable response variation. The second axis is uncorrelated to the first axis, apparently most strongly influenced by Module % but weakly related to the two “Test (code skill/knowledge)” vectors. This axis describes a further 5% of variation in response data. Table 2 coefficients ~ 0.85 and ~ 0.70 express that the correlation between response based and explanatory-variable based axes are highly significant. The Monte Carlo permutation test confirms the overall significance of the model ($p=0.044$).

It is clearly evident that the two “Test (...)” items explain most variation in response (behavior) data, although the overall module grade (Module %) is also strongly related to response variation in both first axis and the orthogonal second axis. Those response variables most strongly related to explanatory variation of interest included behaviors of independent study and homework (16 - only work in practical sessions; 19 - work at home) and peer collaboration (1), but surprisingly weakly associated with ‘Attendance’. The latter is the shortest and least significant vector in the entire model. Further investigation revealed that this apparent anomaly may be partly attributed to a small group of students with advanced subject knowledge who did not attend regularly.

Table 2. Summary statistics for Redundancy Analysis and Ordination presented in Figure 2

<i>Statistic</i>	<i>Axis 1</i>	<i>Axis 2</i>
Eigenvalues	0.0915	0.0516
Explained all variation (cumulative %)	9.15	14.31
Pseudo-canonical correlation	0.8523	0.6975
Explained fitted variation (cumulative %)	54.04	84.52

Table 2 Notes: (1) Explanatory variables account for 16.9% all variation (adjusted explained variation is 4.5%); (2) Permutation Test Results (on all axes): pseudo- $F=1.4$; $P=0.044$.

Explanatory variables (red in Figure 2) were clearly effective in describing response variation. However, the orthogonal relationship between the key element of assessment (Module %) and the un-assessed tests on code understanding and skill, unexpectedly suggested that strong module performance was not necessarily a reliable predictor of programming ability. This finding was clearly of pedagogic concern. A simple correlation check (Pearson product-moment) also suggested that although “Test (code understanding)” was significantly correlated with “Module %” ($r=0.56$, $p<0.001$), “Test (code skill)”, was not correlated with overall assessment grade ($r=0.27$, $p<0.117$).

There were strong correlations between “commitment” indicators (16 “only work in practical - disagree”, 19 “work at home – agree” and 12 “maintaining logbook - agree”).

Among other exploratory patterns of interest was the correlation between response 13 (“good for learning C type languages”) and the second axis, as well as a strong relationship to overall “Module %” and the evident orthogonal relationship with “Test (code skill)”. This indicated that appreciation of Ceebot may not have been so strongly expressed by more adept programmers. Similarly, the strong negative correlation between the indicator for collaboration (stated as “It is very helpful to discuss Ceebot problems with friends” in the questionnaire and labeled “1 collaboration” in Figure 2) and “Module %” suggested that such behavior was more greatly valued by those achieving high overall module grades than those who were ‘purely’ proficient at programming.

Although there are other correlations and patterns deserving of pedagogic attention, the aforementioned represent the most significant and, with respect to this analysis, are perhaps within limits of model interpretation.

The proportion of overall variation explained by learning performance indicators may appear low. However, this is not surprising given the exploratory nature of questionnaire items and the fact that some questions will unavoidably introduce variation that is unrelated to learning performance.

Among objective measures used to filter such extraneous variation was stepwise forward selection of factors explaining most variation in learning performance. To do this it was necessary to adopt a conventional view that the learning performance indicators “Module %”, “Test (code skill)” and “Test (code understanding)” were responses to explanatory characteristics (behaviors, preference and acceptance characteristics) expressed in the questionnaire.

The following analysis therefore uses forward selection and also excludes variables that contribute little to the overall model, such as “Attendance”, or are redundant through collinear/inter-correlation with other variables, for example “Test (code understanding)”. It also observes Canoco’s over-fitting alert, based on termination criterion of Blanchet *et al.* (2008). This suggests when further stepwise inclusion is unadvisable on the grounds that adding another

predictor would increase the R^2 (adjusted) to a value greater than that would be otherwise obtained by fitting the full model with all predictors.

After removing obvious sources of collinearity, stepwise selection observing termination criterion resulted in a simpler model (Figure 3) with only six questionnaire items. A reduction in ‘unexplainable’ variation is partially responsible for increased eigenvalues and overall variation explained by the model (Table 3 indicates the first axis accounts for approximately 35% of overall variation and the second axis accounts for some further 13%). However, a direct comparison should not be made with the earlier RDA due to the changed focus of analysis. The overall model is highly significant (Table 3 notes: pseudo- $F=15.7$; $P=0.002$).

The alignment of item 19 (full form, “I work on Ceebot exercises at home”) with the first axis and the two indicators of learning achievement, and the overall length of vector suggests that this is the most important item describing variation in learning performance. This is confirmed by the statistics for stepwise regression (Table 4) that indicate item 19 alone accounts for more than 33% of the explainable variation and that its contribution is also highly significant (pseudo- F 6.5, $P=0.004$).

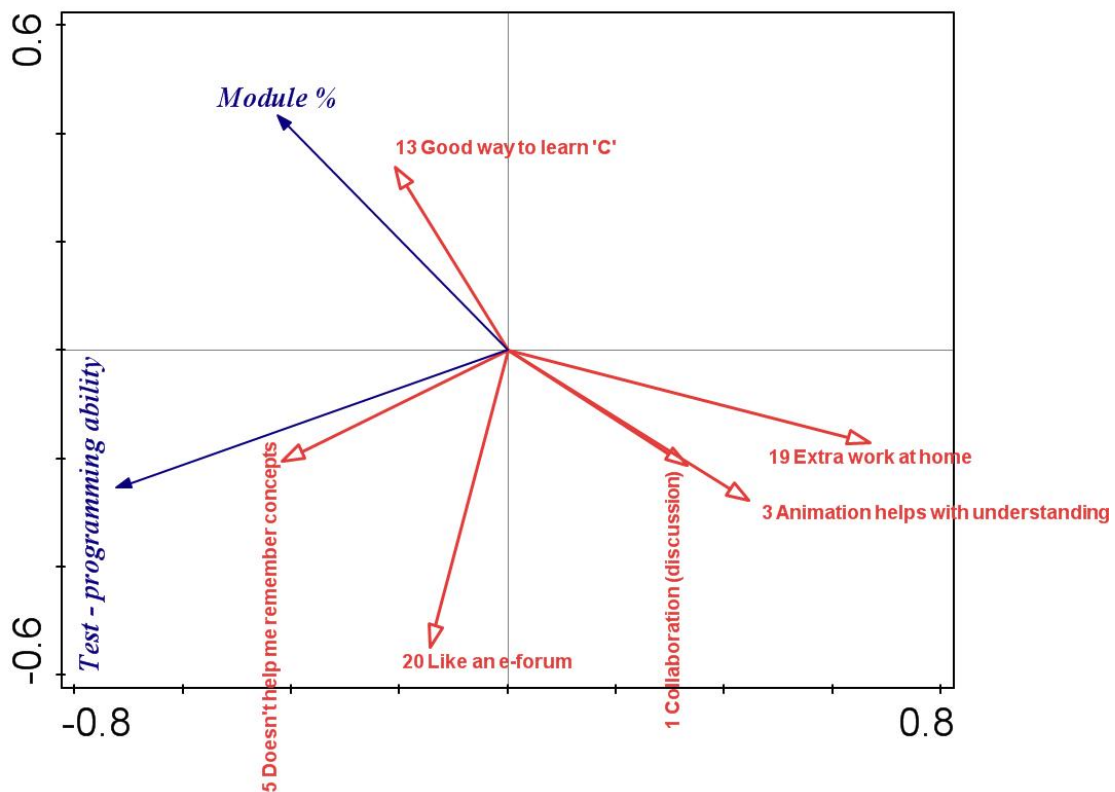


Figure 3. Ordination Biplot for Redundancy Analysis of learning performance responses (blue vectors) against step-wise selections of behaviors, preference and acceptance (red arrows). Notes: (1) response and explanatory variables are ‘switched’ in relation to the earlier analysis so that learning performance are responses and questionnaire variables are explanatory, thereby allowing stepwise inclusion of key variables and elimination of collinear or otherwise redundant terms; and (2) stepwise selection is terminated on according to Canoco 5’s internal over-fitting warning based on criterion of Blanchet *et al.* (2008).

Of items remaining after stepwise selection, 13 “Ceebot is good for learning C ...”, 20 “I’d like an e-forum ...”, 5 “Ceebot doesn’t help me remember concepts ...” and “3 Ceebot environment aids understanding ...” each account for some 14-15% of explainable model variation (Table 4.). The

last item included in stepwise selection, “1 Collaboration (discussion)” in Figure 3, accounts for a smaller proportion of model variation.

The alignment of Ceebot acceptance indicators (item 5, disagreeing that Ceebot doesn’t help with remembering concepts and the test of programming ability; item 3 agreeing that Ceebot animation assists understanding and a balanced alignment between both indicators of learning performance) suggests overall appreciation in Ceebot as a learning platform.

Table 3. Summary statistics for Redundancy Analysis and Ordination presented in Figure 3

<i>Statistic</i>	<i>Axis 1</i>	<i>Axis 2</i>
Eigenvalues	0.3517	0.1260
Explained all variation (cumulative %)	35.17	47.77
Pseudo-canonical correlation	0.7494	0.5806
Explained fitted variation (cumulative %)	73.63	100.00

Table 3 Notes: (1) Explanatory variables account for 47.8% all variation (adjusted explained variation is 37.0%); (2) Permutation Test Results (on all axes): pseudo- $F=15.7$; $P=0.002$.

Two items suggest the value of measures for peer communication and collaborative working (20 “I’d like an e-forum ...”; 1 “Helpful to discuss Ceebot tasks with friends ...”). Item 13 is somewhat anomalous in that no one disagreed that Ceebot is good for learning C (i.e. the entire range of Likert responses were only in categories 1, 2 and 3), thus its alignment with Module % suggests that respondents generally agreed or were neutral but didn’t ‘strongly agree’ with this assertion.

Table 4. Summary statistics for Predictors included in Stepwise Forward Selection in the Redundancy Analysis and Ordination presented in Figure 3

<i>Variable</i>	<i>Variation Explained %</i>	<i>Model Contribution %</i>	<i>Pseudo-F</i>	<i>P</i>
19 I work on Ceebot exercises at home	16.1	33.6	6.5	0.004
13 Ceebot is good for learning C ...	6.7	14.0	2.8	0.084
20 I’d like an e-forum ...	6.9	14.5	3.1	0.064
5 Ceebot doesn’t help me remember concepts ...	7.6	15.8	3.7	0.028
3 Ceebot environment aids understanding ...	6.8	14.2	3.6	0.018
1 Helpful to discuss Ceebot tasks with friends ...	3.8	7.9	2.1	0.128

Conclusions and Recommendations

With respect to the primary aim, “to evaluate a Redundancy Analysis as a multivariate statistical tool for exploring student engagement and performance in a learning environment”, findings indicate that RDA was appropriate and useful for describing patterns of student behavior and preferences associated with measures of ‘success’. The canonical facility to directly focus or constrain analysis to gradients of interest, combined with powerful biplot visualization of variable influence, vector association and collinear effects provide the researcher with a robust method for identifying pedagogically meaningful influences. In this study, centered on the Ceebot learning environment, RDA was found to be effective in screening indicators and behaviors that may be predictors of learning performance and of acceptance of the environment.

The secondary aim, “of revealing interrelationships between student behaviors, preferences and achievement using the Ceebot environment for learning computer programming”, was only achievable because both conditions were satisfied that: (1) RDA was demonstrated to be an appropriate form of analysis; and (2) that most questionnaire items were, to greater or lesser extents, valid predictors for the measures of learning performance.

Although a number of patterns of pedagogical interest were noted, key and significant findings were: (1) the weak association between overall module assessment and the computer programming skill ability; and (2) the three indices of learning performance were correlated with behaviors of independent study and peer collaboration but not with attendance. From a perspective of teaching practice, results indicated that logbook based assessments may need to be revised to more closely align with programming skills valued in the workplace. There was also some evidence that requirements for attendance may be reconsidered, perhaps relaxed for experienced computer-programmers able to demonstrate prior learning. Additionally, opportunities for collaborative learning (discussion) were valued and positively associated with learning performance. From a learner perspective RDA revealed that the key predictor of success was commitment to continue module work outside timetabled sessions.

Regarding ongoing work and recommendations for readers interested in using canonical tools, the canonical viewpoint of learner behaviors determining positions along landscape gradients of performance is novel perspective. This, however, requires further investigation to determine whether such a paradigm may aid in detecting and encouraging behavioral transformations that ‘predict’ success. It is anticipated that research will continue to use RDA to monitor effects of modifications to teaching practice. One such planned modification is the inclusion of formative tests to develop code-skills.

Acknowledgements

This study was made possible through the generous and diligent participation of colleagues and students delivering and attending BSc modules in “Programming Concepts” and “Application Programming” at Bucks New University. The research was funded by Bucks New University.

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Control Grouped Pedagogical Experiment to Test the Performance of Second-generation Web Maps and the Traditional Maps at the University of Debrecen

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Abstract

Almost every component of the information society is influenced by elements built on communication technology. Learning also tends to be related to the dynamic usage of computers. Nowadays, a number of applications (online or offline) are also available that engage large groups of potential users and simultaneously provide a virtual environment to facilitate learning.

This study introduces the self-developed interactive blind map teaching-examining e-learning system of the University of Debrecen. Results of testing the system with a control group are also presented. Both experimental and control groups of students were required to sit a test of topographic knowledge following a semester of study. The pass mark for the test was 80%. The experimental group used the new digital environment to study, while the control group prepared for their exam using paper maps in the traditional way. The key research questions addressed by the study were to determine whether exam results obtained by the group using the 'digital' method better than those of the control's; and if there were a difference between the exam performances of the two groups, was this statistically significant and, therefore, likely to occur in other similar scenarios?

Keywords: Web map; e-learning; education of geography.

Introduction

Both bachelor and master students majoring in geography have to significantly develop their knowledge of topography during their university studies. One of the most fundamental courses for bachelor students is Topography. This establishes knowledge of physical and social geography during the first year. In the next semesters (Table 1) studies focus on specific geographic entities and are confined to a smaller geographical region. For example, in the case of Physical Geography of Hungary students have to be able to locate lands, rivers, mountains on a blind map during the exam. Passing a topography test is a prerequisite of entering several colloquiums, so insufficient knowledge prevents the students even registering for examinations.

Earlier experience shows that students often incorrectly position entities in the blind map. One reason may related to insufficient cartographic and map reading skills. However, maps used for practise are usually created by students who, often, do not pay enough attention to map projection. If the projections of the maps used for preparation and in the exam are different, then it is unlikely that students will be able to correctly locate entities using the blind map. The maximum number of allowable mistakes to pass an exam depends on the course. Nevertheless, the level of aggregation in the blind maps is not standardized. For example, in the case of physical geography tests, recognition of the location of a river or a mountain may help to place additional entities, while in social geography tests (with settlements, buffer zones) not only the physical objects but also cadastral and other borders have to be taken into consideration.

Traditionally, tests are paper-based in all cases. This requires a huge quantity of paper. There are approximately 100 students enrolled on each of the five years and a topography test may be retaken twice in a semester (Table 1). Thus, currently some 10 000 sheets are printed and stored. This volume continues to grow from year to year and The Institute of Earth Sciences has no remaining capacity to archive this information.

Table 1. List of courses with a topography test as a prerequisite

Course name	Semester	Degree	Number of tests	Estimated number of students	Estimated number of tests
Topography	I.	BSc	18	100	1800
The principles of social geography I.	I.	BSc	1	100	100
The principles of economical geography.	III.	BSc	2	100	200
Physical geography of Hungary	IV.	BSc	7	100	700
Social geography of Hungary	IV.	BSc	2	100	200
Physical geography of Europe	IV.	BSc	3	100	300
Social geography of Europe	IV.	BSc	1	100	100
Physical and social geography of the Earth I.	V.	BSc	2	100	200
Physical and social geography of the Earth II.	V.	BSc	1	100	100
Conservation of geo heritage	Autumn	MSc	1	15	15
Total					3715

As a result of the above issues, a suggestion was made to design and develop an easy-to-use blind map based application that could also support the process of learning and teaching. Additionally, this could provide measurable data for further methodological research.

The main aim of application development was to support the work of the Institute of Earth Sciences, and to support teaching-learning processes using online interactive environments (Zichar, 2011). However, an additional benefit is that educators no longer have to correct tests manually, because the application performs it in a few seconds and also suggests an appropriate grade.

Literature Review

E-Learning

Holmes and Gardner (2006) refers to e-learning, as the use of new multimedia technologies and the internet to improve the quality of learning, by facilitating access to resources and services as well as remote exchange and collaboration. This can take place completely online in virtual environments, or, using a combination of virtual and face-to-face environments. E-Learning has potential to influence education positively. It provides great opportunities for both the educators and learners to enrich their educational experience (Albon, 2005; Al-Harbi, 2011). In addition, supported by the openness and flexibility of the internet, e-learning provides the opportunity for teaching and learning transactions with almost unlimited information, and is also relatively unaffected by pressures of time and constraints of distance (Holmes & Gardner, 2006; Oya & Uchida, 2013).

This section provides an overview of the key advantages and disadvantages of e-learning based on the work of Ozuorcun & Tabak (2012).

Advantages of e-learning:

- Class work can be scheduled around personal and professional work, resulting in flexible learning.
- Learners may have the option to select learning materials that meets their level of knowledge and interest.
- Learners can study whenever and wherever they have access to a computer and the internet.
- Self-paced learning modules allow learners to work at their own pace.
- Successful completion of online or computer-based courses builds self-knowledge and self-confidence and encourages students to take responsibility of their learning.

E-learning uses a special teaching/learning model that has limitations too (Mohammedi et al., 2010).

- E-learning requires less contact between the students, and also between the teachers.
- Knowledge about general computer usage and the e-learning system are prerequisites.
- Learning requires a computer and internet access as well.
- E-learning implies different teaching/learning processes and some teachers may have less experience and acquaintance about this processes.
- Lack of face-to-face interaction with a teacher can imply negative impact.

Educational web maps in Hungary

The use of digital maps in education has increased significantly in Hungary (Dombóvári et al., 2010). Maps are also used in areas such as history, biology, natural history, social sciences and medical epidemiology. This trend appears, of course, in our everyday life, when we navigate while travelling or even walking around large shopping centres (Gede et al., 2013; Zentai & Kovács, 2013). Considering such widespread use, learning to read and interpret maps can be regarded to be a general life skill (Jones et al., 2004). According to Neumann (2008), web maps are fundamentally digital maps which are optimized and displayed on a monitor and appropriate for web claims. It is widely accepted that application of these maps is of service regardless of their generation and type. (Kraak, 2001; Zentai & Dombóvári, 2005; Plewe, 2007).

One of the first web map applications was “The Blind Mouse”, published in 2005 and used to support education nationally throughout Hungary (see Figure 1). The program developed at the Eötvös Loránd University is appropriate for checking topographic knowledge. In the course of using this program, one must place the objects appearing on the screen as accurately as possible. The level of difficulty (primary school, high school, and university) can be set in advance. It is important to note that turning on the layers (hydrography, relief and border) clearly helps orientation. A new version of Blind Mouse, “Blind Mouse 3D” was published in 2010 (Dombóvári & Gede, 2010). Although the program remained essentially unchanged, the underlying web map has been updated from a second generation digital map to a fourth generation virtual globe platform. Many elementary and high schools in the country include this application in their education because of its free availability and innovative characteristics.



Figure 1. "The Blind Mouse"

The efforts to design a self-developed interactive blind map teaching-examining e-learning system began in 2010 at the University of Debrecen. The new digital environment for practising, the prearranged control maps and the opportunity to edit the online curriculum are valuable services for numerous students majored in geography. The new e-learning application based on J 1.0 was planned to be used in education and exams as well (Balla, 2012).

Methodology and methods

The implementation steps

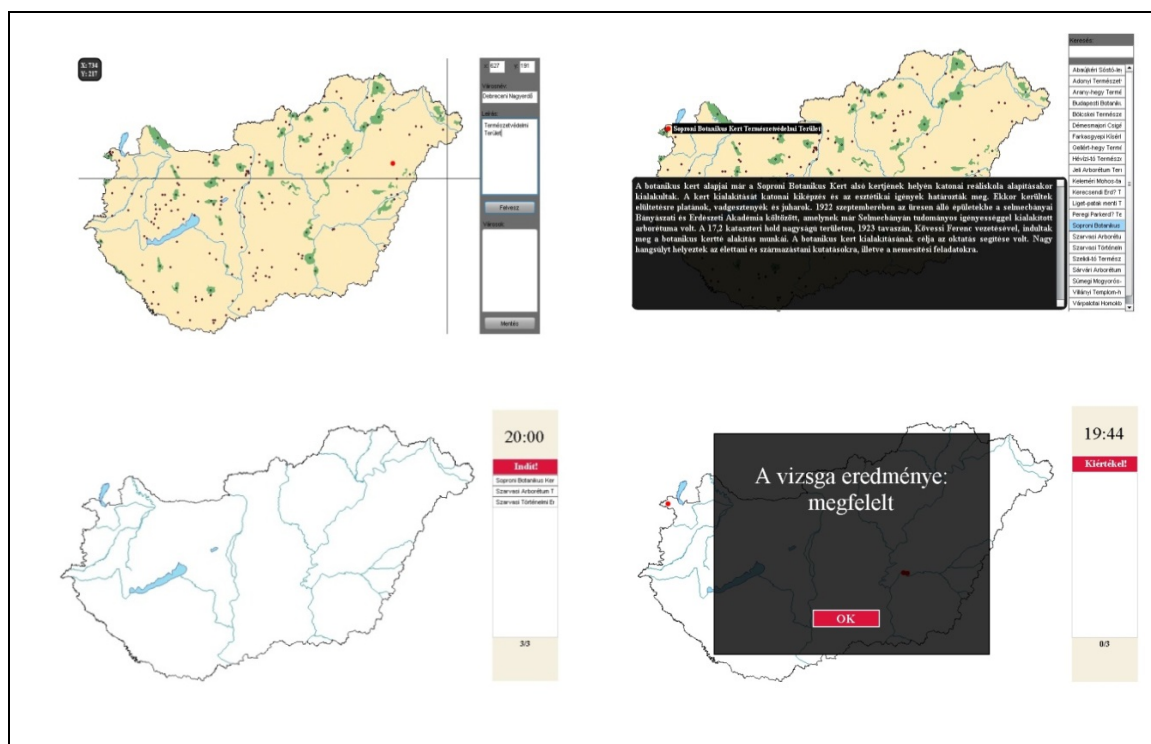
Implementation was in two stages. First, the layers of the digital base map are determined. This is followed by creating the teaching maps, including the natural conservation areas and landscape districts in Hungary, using ArcMap 10. The second stage concerned completing programming

tasks, creating the database and testing the application after establishing the web server. Selection requirements for development technologies included open access and capability for locating geographical objects on a blind map; presenting the attributes of selected objects; round-the-clock availability; and with secure password-protected login user privilege administration facilities.

Layers of the digital base map	Development tool	Statistical Analysis
Nature conservation areas represented by points	PHP (PHP Hypertext Pre-processor)	Analysis of variance
Lakes and rivers represented by lines	Flash	F-test
Nature conservation landscapes represented by polygons	HTML (Hyper Text Markup Language)	<ul style="list-style-type: none"> two-sample t-test Welch-test

The program J1.2

The online user interface of the program, named J 1.2 (supported browser: Mozilla Firefox) is published on a webpage (<http://webgis.web44.net/program.php?tipus=oktato>). This distinguishes two user types: students and teachers. Teachers may specify new exams by providing administrative data, pass-mark (percentage) and fault tolerances (in pixels). The database can be extended to include the locations of new objects at any time. The student user interface is designed for exam practise as well as for formally sitting examinations. Student scores are stored and may be retrieved for individuals and for entire exams. With the help of the interactive mapquiz interface, the geographic objects stored in the database may be browsed and inspected (see Figure 2). The aim of the application is to check and evaluate student knowledge concerning the location of named geographic entities; this following earlier study using the same application. Although level of difficulty is not assigned to the items, teachers are free to select the items to be used in an examination. This, therefore, provides a means for creating tests with different levels of difficulty (Balla, 2013).



The screenshot displays a web-based form titled "Vizsga" (Exam). The form includes the following fields and controls:

- Vizsga elnevezése:** A text input field containing the word "Vizsga".
- Vizsga időtartama:** A numeric input field set to "15" with the unit "perc" (minutes).
- Megfelelés:** A numeric input field set to "80" with the unit "%".
- Tévedési távolság:** A slider control with a yellow circle indicating a value.
- Érvényesség dátum:** A date selection interface showing "Év: 2013", "Hónap: Július", and "Nap: 31".
- Idő:** Two time selection fields: "Mettől => Óra: 15 Perc: 43" and "Meddig => Óra: 16 Perc: 12".
- Városok:** A checkbox labeled "Városok" which is checked.
- Darabszám:** A numeric input field set to "10".
- Vizsga típusa:** A button labeled "Vizsga típusa".

Figure 2. The user interface of "J1.2"

The web maps were designed to be used for tests issued on a course concerning the conservation of geoheritage. The database stores information on nature conservation and landscape protection areas. This comprises some 181 records (with attribute data such as id, name, rank, description). Of these 143 records concern nature conservation areas and the remaining 38 are of landscape protection areas. During the collection of core data a key intention was to develop student geographical knowledge, with a focus on contemporary (live) and physical (inanimate) values of geology in Hungary.

Creation of the experimental and control group

The study was based on two groups of master students, registered for the course "Conservation of Geoheritage". From representative sampling it was apparent that the groups were similar (not significantly different) in their composition. The two groups are identified by X and Y notation. The group Y completed a paper test in traditional way in December 2012. One year later every student from the group Y was assigned a unique account for online application, after collecting data necessary for registration. Since our objective was to compare the results of the two groups, both groups completed the same test.

Results

Test results of the control group and experimental group

The group X and Y had 5 minutes to complete the test. During this time they had to place 10 objects on a blind map as accurately as they could. A pass mark of 80% was required to pass the test. If objects placed on a blind map had point geometry, it was also necessary to also specify a fault tolerance for distance. Here a tolerance of 1 cm was set as the the maximum allowable distance between the true object location and the position specified by the student. Using these criteria, 54 % of students in the control group (Y) passed the test with marks of 80% or greater.

The most common errors were due to inaccurate placing. In 3 or 4 cases, the placement might have been accepted if fault tolerance had been increased slightly.

Contrastingly 77% of the digital test group (X) passed with marks greater or equal to the 80% threshold. On further examination findings revealed that most group X students either scored highly or had only failed to pass by a narrow margin. The overall average score for group X was 8.62, compared to 7.31 for control group Y (see Figure 4).

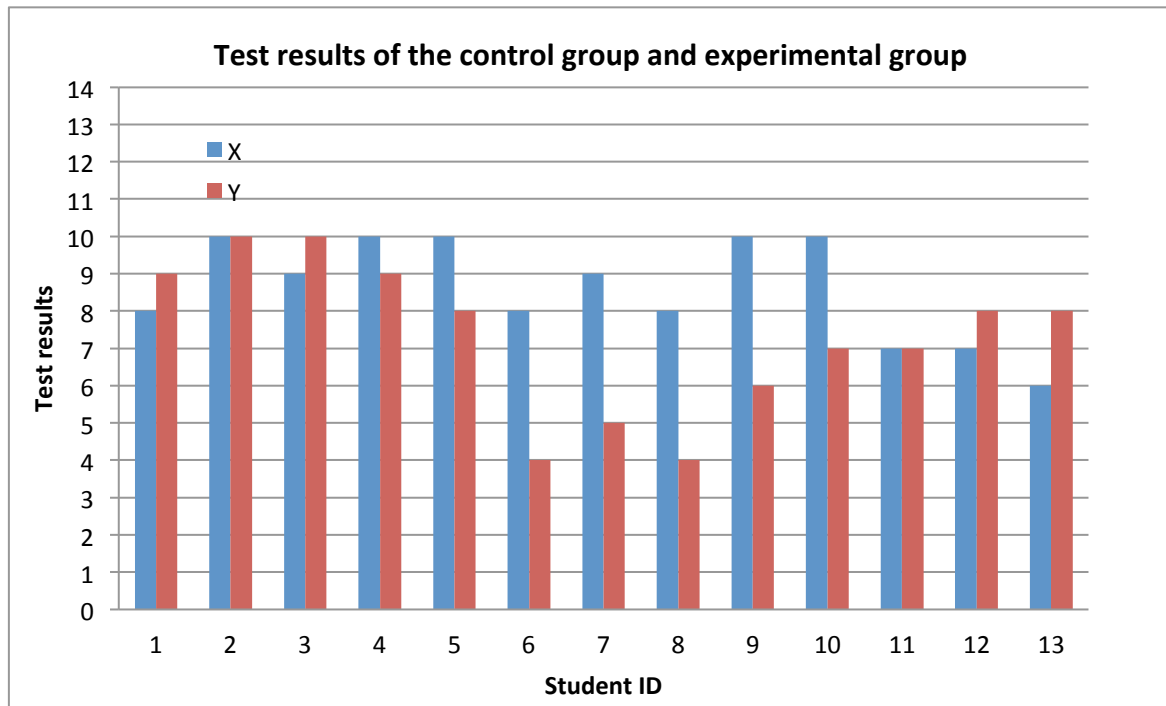
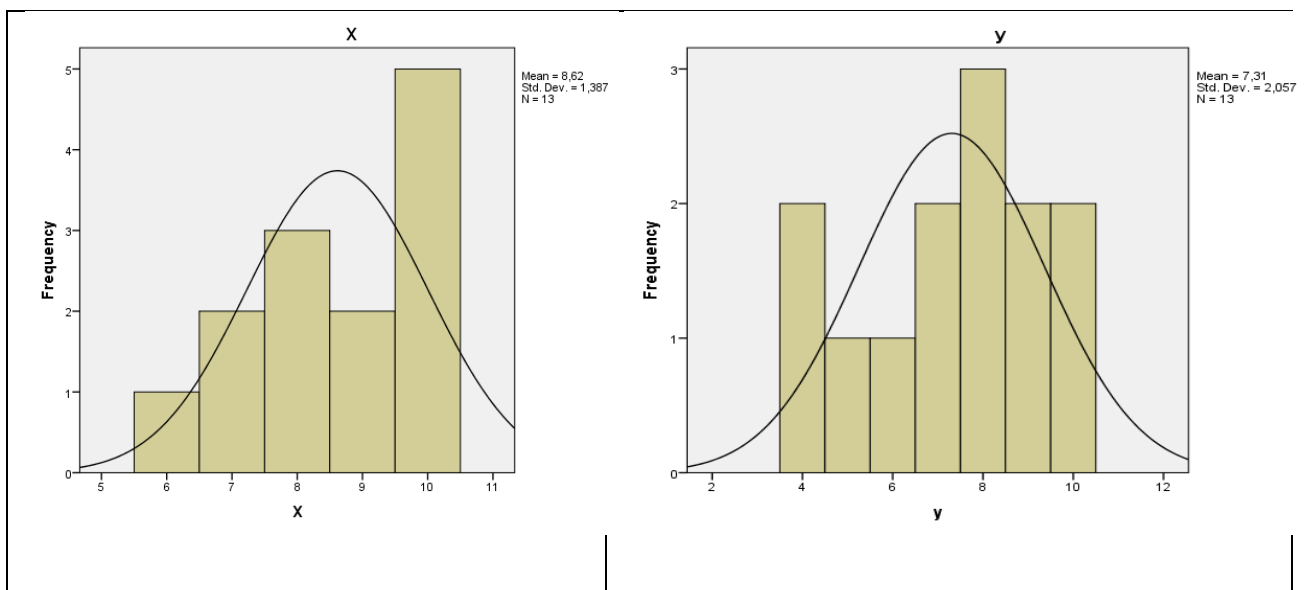


Figure 3. Test results of the control group and experimental group

The result of the hypothesis study

The experimental group consisted of 13 students, just like the control group. The two groups can be considered homogenous according to their main properties. The students had to solve the same test in both groups after a two-month-long practicing period. We are referring the results of the experimental group by X, and that of the control group by Y. The Figure 4 shows that both data lines are of normal distribution despite of the few element numbers. The experiment of the control group begins with examining the variance, than it continues with 2 samples T-test or Welch-test depending on the results (Lóki & Demeter, 2009; Falus & Ollé, 2000).



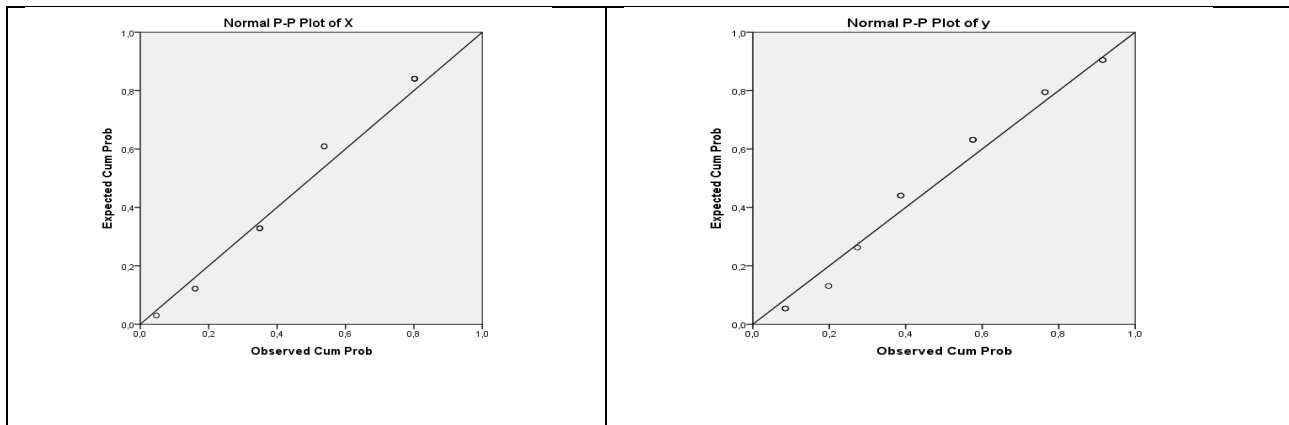


Figure 4. Histograms and plots of group X and Y

The computation highlights that the variance value of the examined samples do not differ from each other significantly, which means that the two-sample t-test can be performed to compare the results (Guilford, J.P., 1965; Peers, I., 1996).

Table 2. demonstrates the result of the two-sample t-test $t^*=1.901$ (the degree of freedom is 24). The probability belonging to this value is 0.69, which means a level of 93.1%. Since the calculated t-value is less than the appropriate value from the table ($t_{table}=2,064$) we have to claim that the difference of the arithmetic means calculated from the results of the two examined samples was random and cannot be explained only by introducing the new methodology.

To sum up, the performance of the students in the experimental group was really better than in the control group, but unfortunately the difference is not significant enough to prove that the better results are related to the new method and that its applications would lead to better results with the given probability.

Table 2. The result of the two examined samples calculated

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Result	Equal variances assumed	1.889	0.182	1.901	24	0.069	1.308	0.688	-0.112	2.728
	Equal variances not assumed			1.901	21.041	0.071	1.308	0.688	-0.123	2.738

Conclusion

This paper presents a self-developed interactive blind map teaching-examining e-learning application of the University of Debrecen, and the test results with a control group.

One of the greatest advantages of using e-learning is that it gives university students greater flexibility in time and place to enhance their knowledge. Moreover, e-learning systems increase motivation; users are more likely to adopt and use e-learning if they deem it makes the process of studying easier (Giraud & Peruch, 1992; Golledge, 1992; Ndubisi, 2006; Al-Harbi, 2011). This study had to address certain limitations.

First, e-learning had not yet been widely adopted in the University Of Debrecen at the time of the study. Secondly, the current study relied on one cohort that may not be completely representative of the wider student body, thus unavoidably affecting the confidence with which findings could be generalized to other circumstances. Thirdly, findings are similar to that of Rittschhof & Kulhavy's (1998). It was also found that a high degree of familiarity with the real regional geography is necessary in order that students acquire a consistent and undistorted knowledge of their geographical environment.

The following conclusions concern key two aspects of the J1.2 teaching program:

Firstly, despite non-significant differences between test scores of control and experimental groups, results of the pedagogical experiment were promising. This was because of the good exam results achieved with a digital platform, and the experience gained during preparation and delivery of the exam. Although statistically unproven, the direction of findings remains consistent with the view that digital maps enhanced learning experience, and this should be perhaps explored further in more detailed studies drawn on larger samples. It also appeared that computer supported teaching and examination could be more efficiently delivered for the 'digital' experimental group than for the control one.

Secondly, concerning the production of digital learning blind maps, GIS software was used to create maps based on a selected area, where geographical entities were represented by using different layers (e.g. hydrography, country border, conservation areas, etc.). GIS and map properties, such as aggregation level, map projection and resolution and the number and type of layers used, all greatly influence the user experience and dynamic of interaction with the mapping application. Thus it is important not to overcrowd maps with large numbers of overlapping elements. This not only undermines the visual experience, but is also an obstacle to processes of understanding and studying. These issues are concerns for the future development of this system. Immediate priorities are to focus on development of the user interface to enhance interactivity and overall experience. At the same time it is hoped that this application will be applied in other courses (such as topography examinations), thereby further disseminating it as an effective and safe environment to support the work of both students and educators.

Future directions

In addition to introducing the mapping application into other areas of education, the following enhancements are also planned.

- Designing a more developing a more attractive graphical user interface
- Creating and applying web maps of third and fourth generation
- Extension of the application to be able to manage line and polygon objects too
- Opportunity for student feedback
- Accuracy tests in maps with different scale
- Increasing interactivity
- Hypothesis study

Acknowledgements

This research was supported by the European Social Fund in the framework of TÁMOP 4.2.4. A/2-11-1-2012-0001 'National Excellence Program' of European Union for Hungary.

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The Effects of Wiki-based Recursive Process Writing on Chinese Narrative Essays for Chinese as a Second Language (CSL) Students in Singapore

Chee Kuen Chin, Cheng Gong, and Boon Pei Tay

Abstract

This paper reports on the effects of using wiki-based process writing in Singapore's Chinese as a Second Language (CSL) scenarios. A group of 32 Secondary 1 (Seventh Grade) students ("Students") received various forms of online scaffolding at different steps of the writing process over two years. A whole set of teaching materials on 45 writing skills was developed and uploaded to the Wiki platform through five recursive cycles. In each cycle, the students were encouraged to apply skills they learned via Wiki platform in their writing and afterwards work as a team in the platform to peer-review each other's first draft. With feedback received from peer revision, students proceeded to edit their first draft, focusing on the content of narratives and the appropriateness on their use of micro writing skills. The scaffolding decreased as the project progressed. Students' pre-, mid- and post-writing tests were marked and compared. The authors analyzed the impact that the feedback in the process had towards the students' overall writing performance. It was discovered that students' quality of written products was improved in general. It was also discovered that students benefited the most from giving remarks to their peers' writing. The revision patterns of high, medium and low language ability students were also compared. It was found that the higher the language ability of the students, the more concerned they were with macro level for their revisions. ICT-mediated process writing has not garnered much attention in the field of CSL. The study hopes to contribute to the literature of ICT-mediated writing instruction in the field of CSL.

Keywords: Process Writing; Chinese Narrative Essay; Peer Revision; Recursive Model; CSL.

Introduction

Since educational reforms took place in 1984, the social linguistic environment in Singapore has been undergoing rapid transformation. The transformation is clearly represented by the percentage of ethnic Chinese students whose first home language is English, a figure which rose from 28% in 1991 to 59% in 2010 (MOE, 2010). Ethnic Chinese Singaporean students' linguistic capability in the Chinese language has been on the decline; most of these students find it a challenge to learn Chinese, especially where the acquisition of writing skills is concerned (Liang, 2000).

Today, people communicate using a multitude of methods other than conversing in person or via a telephone. It has become a norm to use highly interactive virtual environments to exchange information and ideas. The Internet provides an alternative outlet for students to publish their work, which gives them the satisfaction and pride of displaying their writing for a potentially enormous audience and encourages greater care in presenting their texts (Hyland, 2003). Language teachers should help students develop a sense of what it means to write for a broader, unknown audience beyond the classroom. This will heighten the writers' awareness that they are writing for an audience, rather than merely writing for the sake of writing.

The emergence of Web 2.0 technology provides new possibilities for language teachers to organize online learning experiences and provide opportunities for students to practice collaborative writing in their target language. It is hoped that by tapping on the advanced technology in the information era, Chinese language teachers in Singapore could better help their students who are taking Chinese as second language (CSL) to improve the writing competency.

This paper explores the effectiveness of collaborative process writing in the Web 2.0 environment for lower secondary CSL students with different language abilities in the Singaporean context. The study hopes to contribute to the literature of ICT-mediated writing instruction in the field of CSL.

Literature Review

Process writing and its effectiveness

Writing is a complex process which involves a lot of cognitive and meta-cognitive activities (Murray, 1972). In the conventional product-oriented writing process, students are asked to formulate their ideas by using prescribed rhetorical frameworks set by teachers and to submit their written work for grading. The generation, formulation and development of ideas seem to be ignored throughout the whole writing process (Zamel, 1982).

Process pedagogy arose in the late 1960s in response to the dominance of product-centred pedagogy (Matsuda, 2003). In the 1970s, second language educators started to show interest in finding out how written work is produced by second language writers (Hedge, 2011). Many educators and language teachers have since done research about the teaching of writing to second language writers (Ramies, 1978, 1987; Taylor, 1976; Young, 1978; Zamel, 1976, 1982, 1983, 1987; Jacobs, 1982). Their findings have shown that writing is not a straightforward process and should be viewed as "non-linear", exploratory and generative (Taylor, 1981; Zamel, 1983). Writing is a process of discovery in which ideas are generated and not just transcribed, as writers think through and organize their ideas before writing and revising their drafts (Lee, 2006).

The writing process is recursive in nature whereby revision and writing are integrated, and initial ideas get extended and refined (Zamel, 1982). To a large extent, a written product is "the outcome

of a set of complicated cognitive operations" (Hedge, 2011: 303) that involves planning, drafting, revising and editing. Teachers should guide learners in the writing process in a recursive, interactive, and potentially simultaneous way (Hyland, 2003).

It was observed that revising took place throughout the writing process and generally involved considerable changes (Zamel, 1983). Proper and systematic guidance in the process will assist second language writers to generate logical, elaborate or consciously-written works. Providing constructive feedback is one useful way of guiding second language writers (Hyland, 1990). Group work is also frequently a key element in generating ideas, collecting information, focusing priorities and structuring a piece of text. This is often achieved in a group environment where practical, genuine communications abound (Hyland, 2003).

Peer-review for learning during process writing

Peer review is a form of collaborative learning. It requires students to act as the audience and collaborate in their peers' drafts as they share opinions and ask questions. It is a frequently-used technique in the process-oriented writing approach (Villamil and De Guerrero, 1996; 1998). Beaven's (1977) study shows that the students would most probably rely on the teacher during the writing process if the teacher was the only reader of the written product, whereas students would have more ownership of their writing and give more consideration to their audience if they were aware that there were readers besides the teachers. When students are to give feedback, they benefit from reading other students' work (Rollinson, 2005).

Students also "[transfer] abilities they learn when reviewing peer texts" (Lundstrom and Baker's, 2009:38). Peer revision fosters communicative behavior because it provides a chance for students to explain, defend and clarify their points of view while peer feedback has a significant effect on the quality of writing and leads to more learner autonomy (Villamil & De Guerrero, 1996; 1998). Through peer review, L2 writers "discovered the discrepancy between their intended and understood meaning of their text" (Berg, 1999:231). In revising their peers' work, students highlight to each other the areas that did not make sense to audience and compel each other to make changes.

The research findings quoted above recognized the effectiveness of peer revision and the importance of guiding students in the revision process. However, most of those research findings did not make comparisons between peer feedback and teacher feedback and tended to undermine the teacher's role in the revision stage. Others have suggested that in comparison with peer feedback, teacher feedback is more valued and has a more important influence on students (Connor & Asenavage, 1994; Miao, B adger & Zhen, 2006; Paulus, 1999; Zhang, 1995). Some research findings have suggested that we need to combine both teacher review and peer review to improve the quality of writing (Tsui & Ng, 2000). The extent to which peer feedback and teacher feedback each contributes to the quality of written products is worth exploring further.

Using Wiki to support collaborative process writing

By definition, collaborative learning is "learning in groups with a high degree of interaction between the group members in a defined setting" (Hoppe, 2010:6). Collaborative writing process requires students to work together to gain insight into the topic and refine their written works. Communication in an online collaborative environment helps in information exchange, knowledge building and promotes the quality and the relationship of ideas (Peres and Pimenta, 2010; Karayan and Crowe, 1997), which will facilitate generating, organising and revising of ideas in the writing process. An online learning environment facilitates interaction as many students would be able to communicate ideas simultaneously and hence would be able to

produce more feedback on peers' composition (Schultz, 2000). Learning through the use of social media stresses the use of knowledge networking and community building to leverage, sustain and share knowledge in a collaborative way, which emphasizes on penetrating classrooms boundaries (Paliktzoglou and Suhonen, 2014).

The emergence of Web 2.0 technologies in recent years has created good prospects for the process-oriented collaborative writing approach. Among the wide range of interactive technologies, wikis are platforms where content can be created, edited and shared by users (O'Neill, 2005). Unlike traditional course systems, wiki provides users with simple features like open editing and the latest supporting social media tools, hence it has the potential to facilitate and enhance online collaboration (Elgort et al., 2008; Alexakis et al., 2014). It emphasizes "active participation, connectivity, collaboration, and the sharing of knowledge and ideas among users" (Wang et al., 2013: 216) and provides "an interactive process of review from a group of people who are also sharing the review as authors" (Clarke, 2008: 275). Wiki provides an environment for L2 students to write and edit collaboratively, creates a platform for L2 teachers to trace the content and timing of the revision and enables them to examine and derive revision patterns from students' writing, allowing them to plan and remedy their instructions according to students' needs in the next round of composition exercise.

The user-friendly and student-centered characteristics of the Wikis have opened up venues for language teachers to experiment with process-oriented approaches in the teaching of writing. Wong et al (2009) advocated a recursive, bottom-up process writing approach whereby groups of Chinese as a second language (CSL) secondary school students were required to collaboratively carry out "word/phrase pooling", "sentence making", "paragraph writing" and "outlining" on wiki, and eventually compose their essays individually. Results showed that students' micro-skills for writing were improved significantly due to peer coaching. Liou and Lee (2013) compared wiki-based collaborative and individual writing processes in a class of Taiwan university students taking English as their second language. Students started with planning and brainstorming together and composed their drafts on wikis. Results showed that students who worked in the collaborative groups produced longer and more accurately expressed written products than those who worked in individual groups. All students who participated in the study felt that collaborative activities improved their writing.

Although results of these studies reveal positive impacts of wiki-based collaborative writing, they are not without limitations. Wong et al.'s (2009) study only focused on micro-skills for writing that brought about surface changes. Their study did not investigate the impact of the model at a macro level which could involve changes in content organization, overall structure and meaning. Liou and Lee's (2013) studies only involved subjects undergoing tertiary education. Their studies were not directly relevant to junior high or secondary level education. All of their studies did not investigate the revision patterns adopted by L2 writers of high, mid and low abilities. The inadequacies of their studies have hence created room for our present study.

To date, ICT-mediated process writing has not garnered much attention in the field of CSL teaching. Studies on the effects of wiki-based collaborative writing on secondary or junior high CSL students are scarce in present literature. Henceforth, the present study would like to tap on the advantages of Web 2.0 technology, using wiki as the study platform, to investigate the effect of process-oriented collaborative writing in CSL teaching with special reference to the Singapore context.

Scope of Study and Methodology

For this study, we have formulated the following three research questions:

Question 1: Is the wiki-based process writing on Chinese Narrative Essay effective for lower secondary school CSL students in enhancing students' performance?

Question 2: Do the revision remarks or comments received and generated in the writing process contribute to students' overall performance?

Question 3: What revision patterns do lower secondary CSL students with different language abilities show during wiki-based process writing?

Methodology

The participants were 60 Secondary One students from a neighborhood school, forming an experimental class (N=32) and a comparison class (N=28). The whole study lasted for two years. The experimental class was involved in five rounds of recursive writing activities, during which they were given parallel writing instructions and were asked to give group presentations. In the control class, the teacher went about her normal practice but arranged for her students to take the pre-, mid- and post-tests that the experimental class took. Artifacts produced by students of High, Medium and Low abilities from both classes were also analyzed.

Intervention

The intervention involved the following procedures:

Table 1: Procedures of Wiki-based Process Writing Used in the Study

procedures	activities
1. training	Orientation: Students are briefed about the purpose of the project and learn how to use the rubrics
2. writing techniques	Self-directed learning (SDL) of writing techniques via wiki platform
3. check SDL outcomes	Students take quiz in groups
4. in-class teaching	Teachers lecture about the writing materials, focusing on important points and some weak points that caused the students to fail the quiz
5. out-of-class study	Students study good and bad writing samples in groups, follow the scaffolded instructions and learn how to deconstruct a piece of writing
6. group presentation	After out-of-class preparation, students work in groups to present how they differentiate good writing from bad writing and how to improve bad writing using writing rubrics provided
7. first writing	Students draft their writing online outside class
8. peer review	Students do peer revision outside class in a given time using wiki platform
9. second writing	Students try to revise their first draft with suggestions given by their peers and teachers
10. comments	Teacher announces group scores and comments on the common mistakes made by the class during the writing activity
11. finalize writing	Students finalize their writing after class
12. reflection	Students reflect on their performance for this writing activity

Before the study, wiki accounts were created for each student within the class wiki platform. There were five writing activities in the two years' study, excluding pre-, mid- and post-tests. In each writing activity, the students wrote the first draft and then did revision and editing, adding up to a total of 13 attempts at writing. In the first writing activity, we practiced the 12 steps

including the orientation and modelling on how to use the rubrics to assess others' writing. In the subsequent activities, the same 11 steps mentioned in the table above (step 2 to step 12) were practiced and followed in a recursive pattern.

During the orientation, the teacher provided a model by demonstrating how students should assess their peer's work and give feedback, using the structure of peer assessment rubrics and guiding questions, covering writing organization, content, and language. The orientation also covered 10 items of writing, such as theme, choice of materials, plot, emotions, consistency, cohesion, deployment, vocabulary, grammar, and rhetoric techniques. Teacher's modelling may again appear in the first and second writing activity, but will cease from the third writing activity onwards.

In order to strengthen the impact of peer assessment, besides the guiding questions, activities such as 'Tell me why this is a piece of good writing' and 'Come, let Dr. Woodpecker treat you' were blended in. In each of these activities, we provided several steps to guide the students in forming standards on how to appreciate good writing, how to break down/deconstruct texts and how to transform bad writing into good writing. All the activities were arranged for students to carry out in groups so as to facilitate discussion and collaborative learning. After some preparations, the students did class presentations using the guiding tasks and questions. With this kind of 'comprehensible output' activity, the students learned to judge texts critically and to refine and consolidate vague ideas into principles to assess writing by doing oral presentations.

Data collection

We collected three sets of data related to the study. The first comprised pre-, mid- and post-test writings for scoring and analysis of the artifacts. The second is the feedback that the students received from their teachers and peers as well as the feedback that they gave out to their peers. Thirdly, we collected information on how students of different levels revised their writing by conducting face-to-face interviews with selected student representatives from all three High, Medium and Low ability level students after showing them the differences between their first draft and final draft. This case study data was intended to help us find out the revision patterns of students with different levels of proficiency, which could help teachers guide students of different levels to revise their writing. The interviews were audio taped and transcribed.

Measurement

In pre- and post-tests, students were asked to write a timed essay. The writings were marked by raters using the grading rubric of ten items, with a total score of 100. The grading rubric was developed by the project team but was validated by an external consultant who is a professor specialized in writing assessment and is now working at Hong Kong Polytechnic University. The scoring guide is based on a ten-point scale for each of the ten items. All the essays were graded by at least two raters and the scores were then averaged.

The three raters worked several times before and during the study to mark. They were given same essays to mark, compared their scores and discussed their reasons for choosing the scoring, followed by adjusting the scoring together until all the raters agreed on a common score. They repeatedly practiced this until all felt comfortable and equipped to rate within the same scale.

Analysis

In order to answer the first research question, an independent-sample t-test was conducted. This was accompanied by the calculation of the effect size (in terms of Cohens' *d*) to indicate the magnitude of the observed mean difference. In order to answer the second research question, we

calculated the correlation between the post-test results and amount of feedback that the students received from both their teachers and peers as well as the feedback that they gave to their peers. The third research question was answered by analyzing the information gathered from face-to-face interviews with students with different levels of proficiency.

Findings

t-test and effect sizes for the writing scoring

Before answering the first research question of the effectiveness of intervention on process writing, we verified that the experimental and comparison classes were equivalent. This was done by running the independent t-test on the writing scores of the two classes. As shown in Table 1, for the pre-test, there is a mean difference of -2.58 ($t = -1.30$, $d.f. 58$, $p > 0.05$) indicating that the two classes were equivalent but the experimental class scored lower than the comparison class. The Cohen's $d = -0.34$ indicates a small effect size which is not trivial to be dismissed. On the post-test, however, the experimental class scored higher than did the comparison class, with a mean difference of 3.06 ($t = 1.67$, $d.f. 58$, $p < 0.05$). The corresponding Cohen's $d = 0.44$ indicates a small but nearly medium effect size.

Table 2. Mean Comparisons on Writing Scores

	Experimental group (N=32)		Comparison group (N=28)		Mean differences	t-value	Cohen's d
	Mean	SD	Mean	SD			
Pretest	57.44	8.89	60.02	5.96	-2.58	-1.30	-0.34
Posttest	61.17	8.27	58.11	5.40	3.06	1.67	0.44
Gain	3.73	7.69	-1.91	5.10	5.64	3.29	0.86

Notes: (1) Effect size Cohen's d was calculated using the web-based Effect Size Calculator of the University of Colorado (<http://www.uccs.edu/~lbecker/>) which uses the pooled standard deviation as the denominator. For gain-scores, $SD = \sqrt{(S1^2 + S2^2 - 2*S1*S2*.6)}$, assuming a $r = .6$ between the pretest and post-test scores.

As noted previously, the initial difference favoring the comparison class is not so small that it can be totally dismissed. To offset this disadvantage to the experimental class, a gain-score analysis was attempted. As can be seen in Table 1, the experimental class has gained by 3.73 from the pretest to the post-test whereas the comparison class has in fact deteriorated by -1.91. This suggests that, by comparison, the experimental group has gained by 5.64 ($t = 3.29$, $d.f. 58$, $p < 0.05$) through the intervention. The corresponding Cohen's $d = 0.86$ indicates a large effect size. This leads to an affirmative answer to the first research question: the wiki-based process writing on Chinese Narrative Essay was effective for lower secondary school CSL students in enhancing students' performance. Effect size is typically used at the conclusion of a research project to ascertain its success or lack thereof (Soh, 2010). The obtained Cohen's $d = .86$ for the gain scores indicates a large effect size. This compares very favorably with the average effect size of Cohen's $d = .40$ recommended by John Hattie (1999, 2009, cited in Soh, 2010) as a benchmark. Hattie's (2009) study, with a large number of more than 800 meta-analysis covering 165,258 studies, helps us look at the average effect size of similar experiments in the same field. This helps us to examine the value of the effect size of our own project in a more objective and comparative perspective without focusing solely on the value itself. According to Hattie's (2009) research, the average effect size of 566 computer-assisted instruction experiments is 0.31 and the average effect size of 122 studies on peer influence is 0.38. The obtained gain score effect size (.86) demonstrates that the combination of both computer use and peer review can greatly improve the effect of mere computer use and mere peer assistance in language teaching.

Correlation

To answer the second research question on whether revision remarks or comments received and generated in the writing process contribute to students' overall performance, Pearson's correlation coefficients between the students' individual scores and the number of remarks that the students gave and received from their peers and teachers were calculated. The resultant correlation coefficients are displayed in Table 2.

Table 3. Correlation Coefficients (between the writing scores and the number of remarks received/made)

	Pearson's r
Correlation of remarks only the students gave to their peers with post-test	0.69*
Correlation of all the remarks that the students received from their peers and teachers and gave with post-test	0.49*
Correlation of all the remarks that the students received from their peers and gave with post-test	0.48*
Correlation of remarks the students received only from their teachers with post-test	0.20
Correlation of remarks the students received only from their peers with post-test	0.07
Correlation of remarks the students received from both their teachers and peers with post-test	0.11

Note: Asterisked coefficients are statistically significant ($p < 0.05$, *d.f.* 58, two-tailed).

As can be seen from Table 2, three of the six correlation coefficients are statistically significant. The largest $r = .69$ ($p < 0.05$, *d.f.* 58, two-tailed) goes to remarks the students gave to their peers with post-test. This suggests the effectiveness of involving the students in peer review where they had to be able to evaluate their own works first. This is followed by two moderate correlation coefficients of $r = .49$ and $r = .48$ ($p < 0.05$, *d.f.* 58, two-tailed) when the students both received and gave comments, where the involvement of teachers made very little difference. The statistically significant correlation coefficients echo some researches that address the effectiveness of peer review for writing (Berg, 1999; Rollinson, 2005; Villamil & De Guerrero, 1998), the effectiveness of teacher review (Zhang, 1995; Connor & Asenavage, 1994; Paulus, 1999) and the combined effectiveness of both teacher review and peer review (Tsui & Ng, 2000). It is of interest to note that students benefited the most when they were required to give remarks to their peers' writing using the rubrics; this corroborates with Lundstrom and Baker's (2009) findings.

Revision Patterns of Students with Different Ability

For the third research question on the revision patterns of lower secondary CSL students with different language abilities shown during wiki-based process writing, the researchers compared the written products and interviewed students from the three different levels. Revision patterns of high, medium, and low level students were examined. Typical revision behaviors of the three types of students are summarized below.

High level students tend to examine the theme first when they review either their own or their peers' writings, followed by examining the selection of suitable themes or materials and whether the beginning and the ending cohere with each other. When all these are found to be suitable, they will then focus on checking whether they have used the right level of details in different parts of the writing as well as the rhetorical devices used. Last but not least, they will check the grammar and transitions between sentences and paragraphs.

Medium level students also tend to examine the theme first when they review either their own or their peers' writings, followed by examining the transitions between paragraphs. If they perceive no problems with the content in the writing, they will try to add some writing techniques and rhetorical devices to lengthen their writing. In addition, checking on grammar is considered to be quite important to them as marks will be deducted for grammatical mistakes and wrong words or Chinese characters. Selection of suitable themes or materials was reported as not important for them as they have already planned for the themes and content at the outlining phase of the writing. As long as the writing does not digress from the subject, according to them, writing a less fanciful or less extraordinary essay is not a problem for them.

Low level students are unlikely to focus on the grammar and wrong words or Chinese characters. After they have checked for the theme, they will proceed to check if the ending coheres with the beginning, and if the writing content is suitable. Limited by their language proficiency, techniques like transition, rhetorical devices and the portioning of details that can help improve sophistication are usually neglected.

Results and discussion

The wiki-based process writing of the Chinese narrative essay showed to be an effective model for lower secondary CSL students as far as this study is concerned. It is shown that the study is successful in helping students improve in their overall performance for Chinese writing. We attribute the improvement to the skills and abilities that the students gradually acquired during the five recursive collaborative process writing activities, especially the peer review segment when they mutually engaged with each other in a coordinated effort to raise questions and solve problems together. Sometimes if the feedback was not accepted, they would discuss and justify themselves; this also provides chances for critical thinking and target language output.

As to the contributions of the revision remarks or comments that were received and generated in the writing process towards the overall performance of students' final written products, the findings are complex. Theoretically the amount of feedback received should correspond with the amount of feedback that the students adopted in their editing of the draft. In this study, we have found that the students benefited more from giving feedback and assessing each other through questioning, justifying themselves, discussing and sharing. 'To give is better than to receive'; this saying also applies when we are talking about students' collaborative learning because only when they use the writing rubrics to assess their peers' work and give corresponding suggestions can they really learn from this writing process.

Without giving suggestions, questioning and answering to each other and using the feedback they accepted to edit the first draft, the feedback they received had no impact on their writing. Teachers incorporating this method into their teaching of writing must bear in mind that effective strategies and activities must be created and applied in order to make sure their students produce 'comprehensible output' which proves that the students have actually digested and absorbed the information. Most importantly, students need to be taught and equipped with necessary knowledge and skills to assess their peers' written work via wiki platform. Without proper prior training, students will not be able to perform peer review in the virtual environment. Familiarity

with education technology indeed plays a crucial role in implementing ICT-mediated teaching and learning (Alexakis et al., 2014). Furthermore, peer feedback does not only help students to improve in overall performance in writing, it also encourages critical reasoning as the students need to consider the validity of their peers' suggestions and make decisions on whether to use them or how to use them. When their critical reasoning has been enhanced, it will again help students with their writing because writing is an act of discovering meaning. A willingness to engage with students' assertions is crucial, and response is a central means to initiate and guide ideas (Straub, 2000). Hence, teachers could focus more on the ideas that our students produce, rather than dwell on the formal errors (Hyland, 1990; Murray, 1985).

From the study, it was found that the revision patterns of students with different language abilities were different. We observed that in the peer revision process, the higher the language ability of the students, the more attention they pay to the macro level in their revisions. Students with higher language levels tend to examine the theme first and then the suitability of the materials or coherence of the contents. Students with lower language levels tend to focus more on surface errors like grammar and word collocations. The study also found that the assessment rubrics significantly enhance the quality of writing for students from all three levels. However, if the teachers can provide students with different kinds of feedback and cater to their language proficiency, it will be more beneficial to them. Hence, based on the idea of differentiated instruction, the researchers suggested three different reviewing and editing procedures in the table below for the teachers and students to consider.

Table 4. Revision and Pedagogical Suggestions for Teachers and Students

Language Levels	Suggested Revision Patterns	Pedagogical Suggestions
High	Theme → Selection of Materials → Ending Echoes Beginning → Right Level of Details → Rhetorical Devices → Grammar and Spelling → Transition	Let students read more, especially literary works
Medium	Theme → Rhetorical Devices → Grammar, Collocation and Spelling → Transition → Ending Echoes Beginning → Right Level of Details	Let the students read more about writing techniques, and also help them with good examples on how to review others' writing
Low	Theme → Grammar, Collocation and Spelling → Ending Echoes Beginning → Selection of Materials → Simple Rhetorical Devices	Teachers should focus more on the grammar, collocation and spelling mistakes first, after which students can practice writing techniques starting from 're-write' paragraphs. If they make good progress, they can then follow the revision pattern of medium level students.

Though the positive effects of the process-oriented writing have been supported by the study, we cannot assume that it will take place naturally. It will be unrealistic to assume that students will be able to effectively read and respond to peers' writing and give constructive feedback (Berg, 1999). At the initial stage, teachers need to help students to compare original and reformulated

copies and invite them to comment, question or suggest changes (Hedge, 2011). Students need to be empowered by teachers to perform the peer evaluation tasks. Crucially, students need to be trained and prepared for their participation in peer response activities and collaborative process writing. This is the underlying purpose of putting 'training' as the first step of our 12-step intervention procedures. Through the training, students are oriented to use assessment tools to evaluate organization, content and language of an essay.

Conclusion and implications

The study has shown the effectiveness of wiki-based recursive process writing and also identified the revision patterns of students of different proficiency levels. Wiki platform increased students' chances to read each other's writings. Feedback they gave and received not only enhanced their exposure to the target language but provided more opportunity for critical thinking.

The usefulness of giving peer feedback and reading feedback from both teachers and peers was strongly acknowledged in this study, especially giving peer feedback. The peer assessment rubrics and guiding questions as well as the presentations helped the students internalize what they have learned about differentiating good writing from bad writing and how to transform bad writing to better ones. In order to achieve this, sufficient and appropriate scaffolding is needed. Teachers also need to learn how to allocate time and the level of scaffolding efficiently.

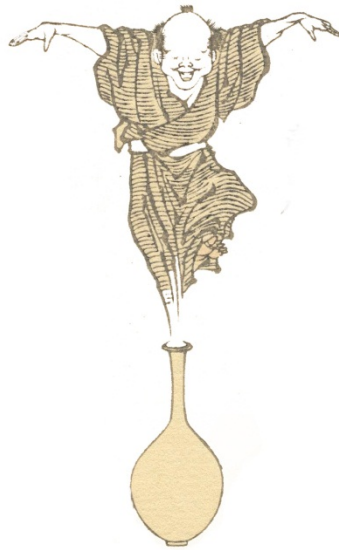
Where pedagogical implications are concerned, teachers conducting writing classes not only need to teach specific writing techniques, but also need to teach students to stand at a higher point to plan and assess writing as well to give them more ownership towards, confidence in and enjoyment from their writing. As the adage goes, *give a man a fish and you feed him for a day; teach a man to fish and you feed him for a lifetime.*

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Impact of Students' Participation to a Facebook Group on their Motivation and Scores and on Teacher's Evaluation

Bernard Montoneri

Abstract

The development of Information and communications technology (ICT) has brought rapid and profound changes in the field of Education. Nowadays, teachers and students alike are engaging on social networks such as Facebook. This study discusses the benefits of using social network in the classroom. It aims at assessing the impact of Facebook on students' motivation and scores in a course of European Literature in a university of central Taiwan. A class of students was taught during the first semester of academic year 2013-2014 (September-January) using a traditional way of teaching. During the second semester (February-June 2014), the teacher used multimedia and Facebook to teach to the same students. They joined a "secret group", that is a group in which only students from the class can join, post, view posts, like, and comment.

This research compares various data from the first and second semester to measure students' improvement in motivation, their participation to the group and their scores. The data collected from the Facebook group during the whole second semester and students' evaluation of the educator at the end of each semester. Students are expected to make some progress and teacher's evaluation should improve. Even though Taiwanese students generally read and write in Chinese on Facebook, it is expected that they exclusively use English to read, share, and comment texts and information concerning the books studied during the second semester, thus increasing their chances to improve their reading and writing skills.

Keywords: Facebook; European Literature; Learning performance; Motivation; Scores.

Introduction

Facebook, the world most popular online social networking service, was founded more than ten years ago by Mark Zuckerberg. As of March 2013, Facebook claimed having 1.1 billion monthly active users (Facebook, 2013). Taiwan ranks 19 worldwide for the number of Facebook accounts (6,992,040 on a population of 23,359,928 in 2014; Berry, 2014). Even though there is already a large number of studies concerning the use of Facebook as an educational tool, few articles have been published on the impact of the social network on students motivation and scores as well as on the teacher's evaluation by students. Moreover, as far as we know, there are scarce studies on the usage of Facebook in courses of literature.

This paper focuses on a course of European Literature offered to English majors at a university in central Taiwan. During the second semester (February-June 2014), all students in the class joined a secret Facebook group in which the teacher as well as the students could post, view, like, comment, and share information, links, pictures, videos concerning the books studied during the semester. Research data consist of students' evaluation of teaching (SET) at the end of the semester, the number of posts, views, likes and comments in the Facebook group during the all semester and students' scores. This study will answer the following research questions:

1. What is the impact of Facebook on teacher's evaluation by students?
2. Is participation to a Facebook group helping students make progress as regard to their scores?
3. Can participating to a Facebook group help students increase their learning motivation?
4. What type of posts students like the most? Can it help teachers in the preparation of the teaching material?

Literature review

Student evaluation of teaching

This article notably analyzes student evaluation of teaching (SET) to highlight how using Facebook during and outside the classroom might have an impact on teacher's evaluation and on students' learning motivation. The objective of using Facebook as a teaching and learning tool in this study is to generate a virtuous circle ("chains of events which reinforce themselves through a feedback loop", according to Webel & Galtung, 2007), that is to create a situation inside and outside the classroom which will lead to an increase of motivation, concrete progress, learning satisfaction, and a better teaching evaluation. SET has become a common measure of teaching and learning quality in higher education (Zabaleta, 2007). This research will use teacher's evaluation at the end of the semester to measure various indicators of learning satisfaction. During the 20th century, no less than 2,000 studies were published on SET (Wilson, 1997). The main purpose of SET is to provide feedback for the improvement of teaching (Marsh, 1987). Student evaluation can also be used to identify indicators of teaching improvement and to provide concrete advice to educators (Montoneri et al., 2012). A growing number of higher education institutions (HEIs) tend to prefer online, anonymous and confidential end-of-term course evaluation (Harrington & Reasons, 2005).

Education and networking: the use of Facebook for educational purpose

Many note that Facebook is very popular among undergraduates, notably in the US (Cain, 2008), Australia (Vivian, 2011), and Great Britain (Madge et al., 2009). According to Souleles (2012), "The popularity of Facebook among university students inevitably raises questions on the educational potential of this Social Networking Site for Higher Education". Analyzing the

perceptions of undergraduate Graphic Design students in a higher education institution in Cyprus, on the use of Facebook for teaching and learning, Souleles (2012) demonstrated that the participants preferred face-to-face instruction and considered that Facebook should complement rather than replace studio practices. Aware of students' preferences, in our study, we used Facebook as a complement to our European Literature class. Our group was primarily designed as a way to communicate with students and share information on the subject outside our limited 3 hours/week class.

According to O'Sullivan et al. (2004), when teachers share information online, related to the class as well as personal information, students reported high levels of motivation and affective learning, indicating positive attitudes toward the course and the teacher. Mazer et al. (2007) note that photographs and information provided on Facebook may positively or negatively alter student perceptions. They showed that participants who viewed the Facebook of an instructor high in self-disclosure would anticipate higher levels of motivation than participants who viewed the Facebook website of an instructor low in self-disclosure. Participants in this study reported that they valued professionalism and the appropriateness of the material on the teacher's Facebook page. I need to precise here that on Facebook, I shared knowledge and information on my wall, but very little personal information (only a few pictures of me attending a conference or going to a foreign country), and no private (family) information at all.

Al-Hammody (2014) analyzed the use of a Facebook group created for a group of students from the University of Mosul, Iraq, for English pedagogic purposes. This study used online questionnaire and phone interviews to examine students' perceptions of the benefits resulting from interacting in the Facebook group. According to Al-Hammody (2014), 54.3% of the participants mostly used the Facebook page for socializing in English, 48.6% used it for vocabulary learning, and 25.7% used it for seeking feedback and for improving translation skills. Manca and Ranieri (2013) attempted to identify the pedagogical potential of Facebook and presented a detailed review of the literature concerning the world most successful social network. They showed that students do not always feel comfortable with Facebook and they do not wish to use social networking as a unique teaching tool for learning.

However, a large number of studies demonstrated that Facebook can be used as an English Language Training (ELT) supportive tool. According to Baran (2010), educators can open and administer Facebook groups for their students to share knowledge, post, comments and dialogue with other members of the groups. Facebook may be used for teaching and learning (Anderson, 2009; Greenhow, 2011); it provides students with extracurricular content resources (Bahner et al., 2012; Pilgrim & Bledsoe, 2011). The educational use of Facebook was found motivating by Backer (2010) who also stated like other scholars that Facebook should be one element among many others in teaching and learning. Çoklar (2012) also observed that Facebook was considered motivating and interesting by students. Shams (2014) investigated the role and effectiveness of using Facebook in tertiary level English language classrooms in Bangladesh. She showed that a decreased direct class contact offsets the motivational factors and positive impacts of using Facebook, notably for students with poor English skills.

Methodology

The data source

The study case is a private university established in 1956 in central Taiwan. The data comes from the university's online student rating system, which provides student feedback to professors at the end of each semester. Participants were English majors in a Department of English. The

characteristics of the data source and research object are as follows:

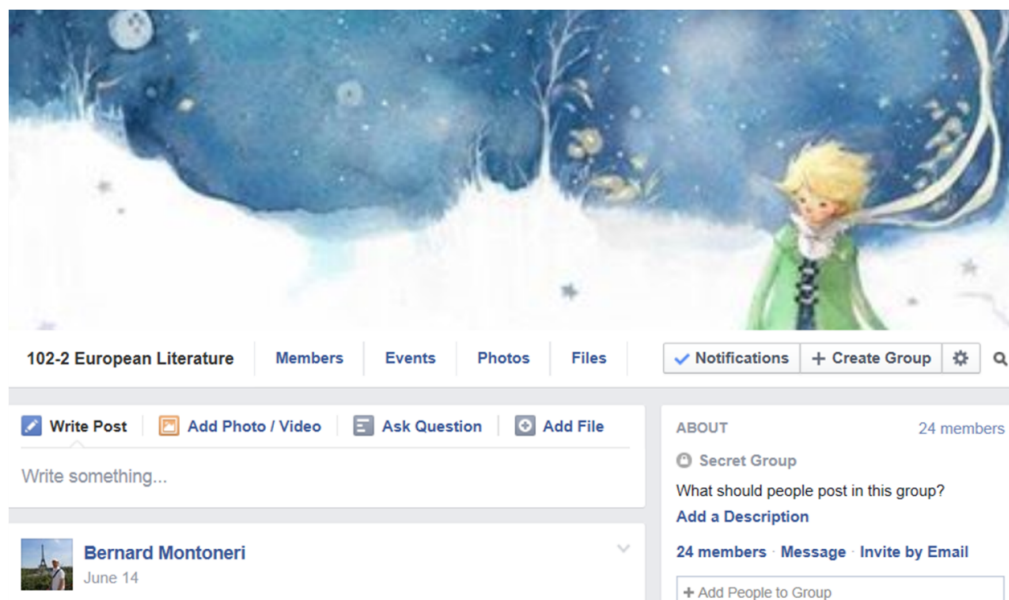
1. European Literature is an optional, three-credit course for junior students in the Department of English (three hours/week).
2. There were 19 students during the first semester (September 2013-January 2014) and 23 students during the second semester (February 25, 2014-June, 14 2014). 14 students have been selected for this study as they were registered during the two consecutive semesters. Other students dropped, were failed or followed only one semester (exchange students from China can only study one semester in Taiwan).
3. The data are based on questionnaires (11 questions) filled out by the students at the end of each semester. Each question is rated from one (very unsatisfied) to five (very satisfied).
4. All the students are required by the university to fill out the questionnaires online if they want their grades to be validated. So it is assumed they all did it.

This study also uses other data, such as students' scores during two consecutive semesters, detailed records of all the posts, views, likes, comments in the Facebook group during the semester and a questionnaire designed by the teacher and filled on February 18, 2014 by the 14 students involved in this study. According to this questionnaire, 100% of the students in the class had a Facebook account as to the beginning of the second semester.

Empirical study

The Facebook secret group was officially opened on February 18, 2014. All the students registered in the class quickly joined and the first post uploaded by the teacher was made on February 25, 2014 (post 1); the last one was made on June 14, 2014 (post 24).

Picture 1. Secret Facebook group: European Literature 102-2.



All the students registered in European Literature joined the Facebook secret group (24 members: 23 + the teacher). "Secret group" means that only students in the class of European Literature can join, post, view, like, comment, and share. The teacher is the administrator of the group; only he can add students to the group.

Picture 2. European Literature 102-2: teacher's post 23



This post consists mainly of pictures of *The Little Prince*. It was uploaded on May 24 and viewed by 21 students. 12 students liked the post (for the sake of anonymity, their names are hidden on all the pictures presented in this paper).

Analysis of teacher's evaluation

Table 1 shows the evaluation score for each question between the first semester using traditional classroom instruction and the second semester using traditional classroom instruction and Facebook. We find that the average score for all the questions has progressed by 1.87% and the average students' final score at the end of semester has progressed by 2.0%. Figure 1 indicates improvement for most of the questions, notably question 3 (4.10%), 6 (5.18%), 9 (5.18%), and 10 (5.57%). The progress of question 3 and 6 implies that the posts provided on Facebook give extra information helping students to better understand teacher's curriculum content; as a result, teacher's performance assessment methods are more fair and open.

The progress of question 9 and 10 implies that students are more confident to obtain better professional knowledge and core competencies. However, the scores of question 7 (-2.62%) and 11 (-1.09%) have decreased. According to the detailed data, more students appreciate teacher's open attitude to communicate with students by using Facebook during the second semester. Nevertheless, several students refused to participate to group discussions via Facebook and without mentioning it during the entire semester. By consequence, these few students gave lower score to question 7 and reduced the average score. The score of question 11 and students' final score show that students need less time and effort to obtain better performance: this is an important encouragement for teachers using social network during and outside the classroom.

Table 1. Evaluation score for each question for the first and second semester using Facebook.

Questions	Scores	Semester 1	Semester 2	Progress (in %)
1. Teacher was able to properly answer students' questions.		4.35	4.36	0.25%
2. Course curriculum structure was complete and covered all the important concepts of the discipline.		4.35	4.36	0.25%
3. Teacher fully grasped curriculum content and gave detailed explanation.		4.24	4.41	4.10%
4. The teaching expression was logical and organized which helped students to easily assimilate.		4.24	4.27	0.88%
5. Performance assessment covered important parts of the course.		4.29	4.36	1.62%
6. Performance assessment methods followed fair and open principles.		4.24	4.45	5.18%
7. Teacher used an open attitude to communicate with students.		4.29	4.18	-2.62%
8. Teacher concerned about students' learning conditions and gave timely counseling.		4.12	4.18	1.56%
9. I think this course has increased my professional knowledge.		4.24	4.45	5.18%
10. The completion of this course has improved my core competencies.		4.18	4.41	5.57%
11. The percentage of my attendance and invested effort in this course: (1) 0-20% (2) 20-40% (3) 40-60% (4) 60-80% (5) 80-100%.		4.41	4.36	-1.09%
Average score of questionnaires		4.27	4.35	1.87%
Student's final score at the end of semester		74.86	76.36	2.00%

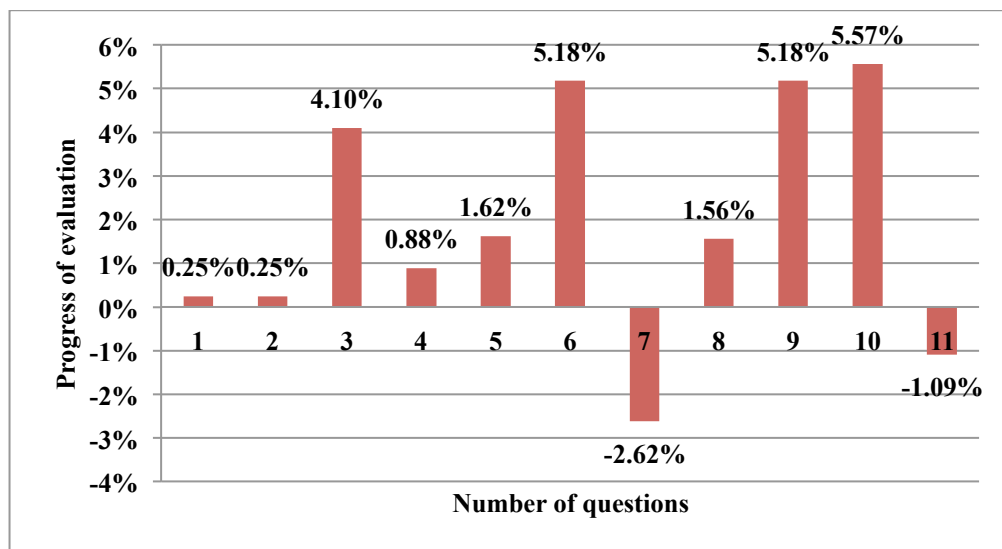


Figure 1. Progress of evaluation score for the semester using Facebook.

Analysis of various types of teacher's posts

The analysis in the previous section demonstrates that the use of social network as teaching and learning auxiliary does improve students' learning motivation and performance. In order to effectively enhance this improvement, an analysis of students' preference concerning the types of posts is proceeded. We define six types, such as quotation of texts (quote), power point files (ppt),

pictures or photos (photo), information of movies (movie) and music (song) adapted from books, and external links (link). It is important for students to realize that most famous movies and musicals for example are adaptations of European Literature (*Les Misérables*, *The Phantom of the Opera*, *The Lord of the Rings* and so many others). Table 2 and Figure 2 show that almost all the students participating to group discussion on Facebook have viewed all teacher's posts. Moreover, students are more interested in the posts with external links, pictures or photos, and information concerning movies. PowerPoint files seem to be less attractive to students, no matter how closely related to the class they might be. The teacher created more than 100 PowerPoint files, most of which are available for download on his website (<http://www1.pu.edu.tw/~bmon/Writing.htm>). This files notably introduce various books, cities, people, as well as historical and cultural movements.

Picture 3. Examples of PPT files for European Literature 102-2. King Arthur



Picture 4. Examples of PPT files for European Literature 102-2. 20,000 Leagues under the Sea

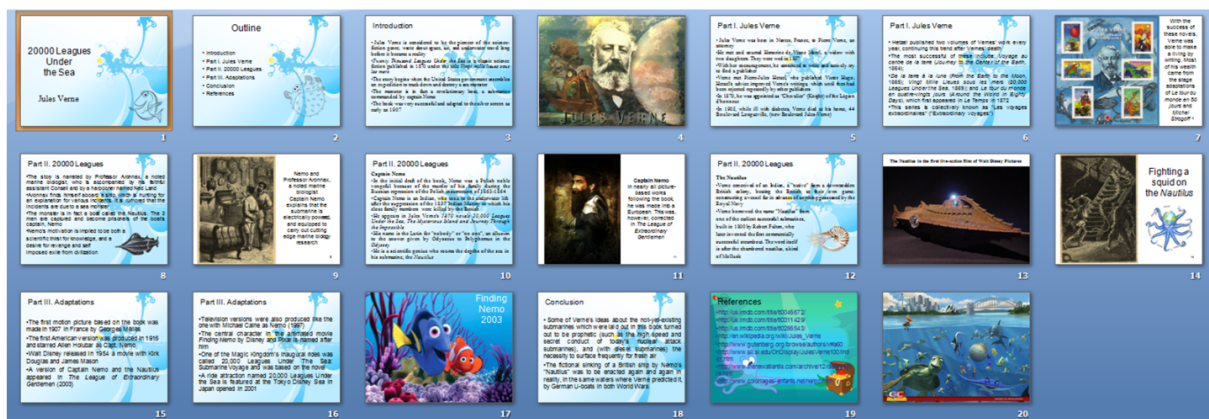


Table 2. Average number of views and likes for different types of posts.

Type of posts	Number of views	Number of likes
Quote	21	4
PPT	21	2
Photo	21	7
Movie	21.2	4.8
Song	21	3
Link	20.8	7.5

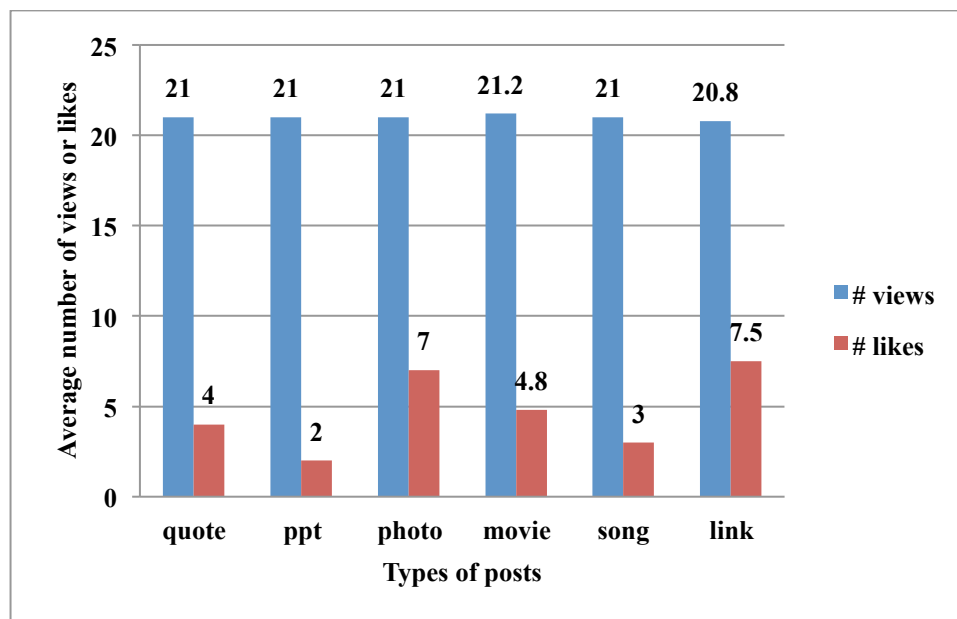


Figure 2. Comparison of different types of posts.

Analysis of students' learning behavior

Table 3 and Figure 3 show that more than half of the students viewed teacher's weekly posts in one week (viewed immediately or during the 7 days after the post was uploaded), notably for weeks 3, 4, 8, 14, and 17. Because week 2 is the opening of this group, only part of students had already joined the group. Weeks 3 and 4 were posted at the beginning of semester; probably students were surprised and more attracted by teacher's new teaching methods by using Facebook. Week 8 and 17 are the weeks just before midterm and final examinations. Table 3 also indicates that more than 80% or even 90% of students have viewed teacher's weekly posts in the first two weeks; the proportion of view time in week 9 is only 62% since students are busy passing midterm exams for all their courses. The proportion during week 12 is also 62%, because 6 students attended other activities and viewed posts later. Consequently, we suggest that teachers post external links, pictures or photos at the opening of the Facebook group and during the weeks before the midterm and final examinations in order to enhance students' learning interest and motivation. On the contrary, during week 5 and 12, teachers may diversify course contents and teaching methods by applying multimedia materials in order to attract students' attention.

Table 3. Students' views time by week

View time \ Weeks	2	3	4	5	8	9	10	12	14	17
1d	0.8	6	14	9.7	11.5	13	7	11	8.7	13
2-3d	1.9	2.5	3	1.3	4.5	0	3	1	5.0	7
4d-1w	10.6	8.5	1	1.0	1.0	0	4	0	4.0	0
1-2w	5.5	2	1	4.0	1.0	0	3	1	0.3	0
3-4w	1.0	0	0	2.3	3.0	5	0	6	3.0	0
1m~	1.3	2	2	2.7	0.5	3	4	2	0.0	0
Proportion in first week (%)	63%	81%	86%	57%	79%	62%	67%	57%	84%	100%
Proportion in first two weeks (%)	89%	90%	90%	76%	84%	62%	81%	62%	86%	100%
Proportion in first month (%)	94%	90%	90%	87%	98%	86%	81%	90%	100%	100%

It appears in Table 3 that posts are viewed during the first days, in general during the first week. All the students who viewed Post 17 did it in a period of 3 days. It depends if they are interested in the posts or not.

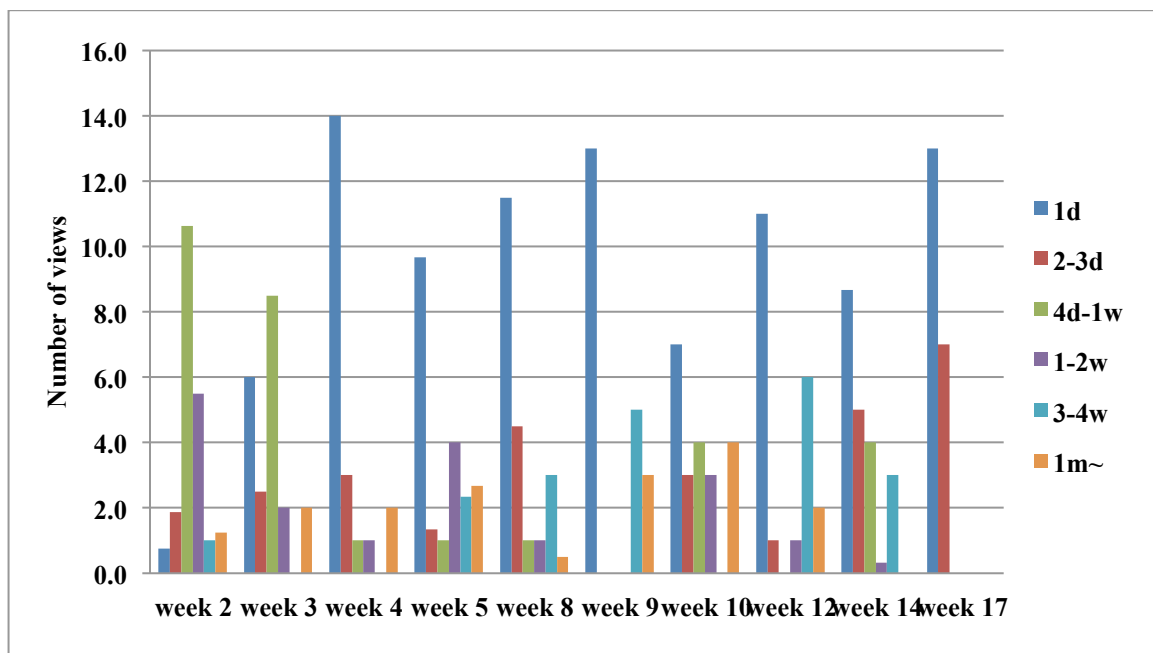


Figure 3. Students' views time to see whether students follow program every week.

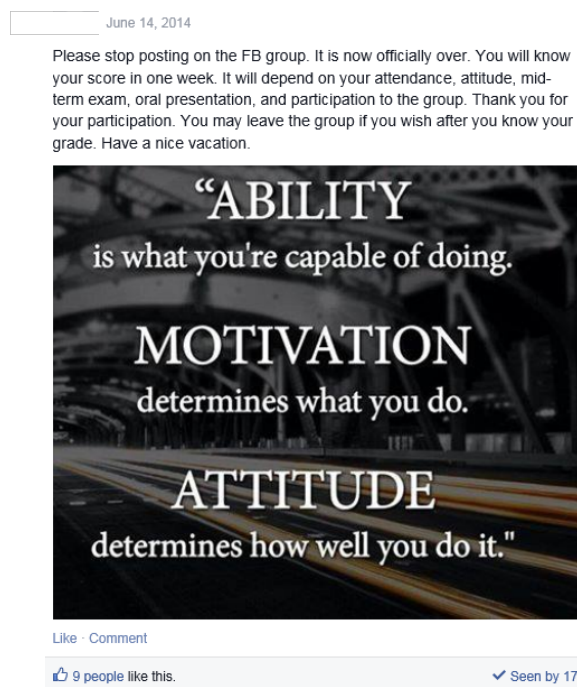
Some students in the group also post. Interestingly, almost all the students view the posts of their classmates. In Picture 5 below, a student posted in March a video about *The Little Prince*; there were 19 views, 1 comment, and 7 likes. There are few comments during the semester, however, students often sent messages directly to the teacher, notably when they are absent, sick or when they have questions about the class and the exams.

Picture 5. Post by a student on March 11, 2014



Picture 6 below is the last post of the semester (June 14). The teacher thanks the students for their participation and tells them they may leave the group. Interestingly, students did not post or view posts anymore, but they did not leave the group (even the very few students who failed the class). 9 students liked the post. it could be interpreted as a sign that they liked this experiment. Some students probably also like the motivational quote, as the teacher insisted repeatedly on the importance of their attitude (attendance, respect, learning attitude).

Picture 6. Last post by the teacher at the end of the semester



Conclusion

Facebook can help educators to present and organize their courses, notably their teaching materials. Teachers can be administrators of a Facebook group, set up some rules and moderate the posts and comments. They can also be members of a Facebook group and interact with

students. As administrators and members, they have the opportunity to observe students' improvement, their motivation, and their needs. They can notalby see which post students prefer and plan their lessons accordingly.

Contribution

The present paper addresses the issue of improving classroom teaching by creating and managing a Facebook group in a class of European Literature in Taiwan. Online students' ratings of teachers at the end of each semester can help teachers to analyze students' motivation and any improvement in their evaluation by students. The four main contributions of this study are:

1. What is the impact of Facebook on teacher's evaluation by students? According to this study, teacher evaluation is higher during the second semester. The average score for all the questions has progressed by 1.87%.
2. Is participation to a Facebook group helping students make progress as regard to their scores? The average students' final score at the end of the second semester has progressed by 2.0%.
3. Can participating to a Facebook group help students increase their learning motivation? Students tend to view posts more at the beginning of the semester because they are surprised and interested by the new teaching method. They regularly and constantly participated to the group during the entire semester. The fact that students were still viewing and liking the last posts at the end of the semester showed their interest.
4. What type of posts students like the most? Can it help teachers in the preparation of the teaching material? Almost all the students participating to group discussion on Facebook have viewed all teacher's posts. They are more interested in the posts with external links, pictures or photos, and information concerning movies.

The score of question 11 and students' final score show that students need less time and effort to obtain a better learning performance. Obviously, a good atmosphere during the class combined with teaching preparedness and clarity may improve students' motivation. It appears that Facebook may also improve students' learning motivation as a complement to the class. The teacher can, outside the classroom (only 3 hours per week), continue to communicate with the students and share more information and documents. Being more motivated and more knowledgeable in the studied subject, students may obtain better grades and feel more satisfied. As a result, the teacher may obtain a higher evaluation.

Future directions

Opening Facebook groups is time consuming and demands constant effort during the entire semester to record all the data necessary in order to analyze any improvement in students' scores, motivation, and in teachers' evaluation. It would probably be easier to create a team of scholars helped by assistants to collect data for more and bigger classes to verify whether the conclusions are the same as in a small class. Research could also focus on the interaction between the teachers and the students in the group, particularly on the number and type of messages exchanged between them (students' questions about the class, the syllabus, and the exams; students telling the teacher they are sick and cannot attend the class; the exam or other related problems).

Acknowledgement

The author would like to thank the Ministry of Science and Technology of the Republic of Taiwan (ROC) for financially supporting this research under contract number 103-2914-I-126-012-A1.

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The Effects of NSTP on the Lives of Saint Louis University Students

Marilyn L. Balmeo, Jeffry P. Falinchao, Kathleen Kaye L. Biay, Joyce Karen M. Ebes, Julianne G. Eclarino, and Ivy Gail P. Lao-ang

Abstract

The National Service Training Program (NSTP) of the Philippines is a form of service learning which is defined as the integration of community services to instruction in order to strengthen the civic and community responsibilities of the students. The purpose of this study is to determine the effectiveness of the NSTP for the students, its influences along self-improvement, performance, community involvement, and demonstration of abilities and skills, and the difficulties encountered by the students while enrolled in their respective NSTP courses. The 1421 respondents of the study were the undergraduate students of Saint Louis University who finished the NSTP courses last school year 2012-2013. The study utilized an adapted survey-type questionnaire to gather the data needed in the study. The findings of the study suggest that NSTP courses are effective and they influenced the self-improvement, performance, community involvement, and demonstration of abilities and skills of the students to an extent. The students are also able to continue to demonstrate the different competencies they learned or acquired from NSTP courses. Moreover, this study reveals that the students often encountered many difficulties while they were enrolled in the NSTP courses.

Keywords: NSTP; service learning; community services; self-improvement; performance; community involvement; competencies; difficulties.

Introduction

National service does not simply mean "serving the public"; it means serving the public under particular political and economic institutions; it means serving the nation in an age of nationalism; and it means constructing the nationalism which it serves (Gorham, 1992). It is practiced in many countries all around the globe. These national services may be in the form of military, non-military services, non-military compulsory programs, and some even integrated in the educational system like in the Philippines in the form of the National Service Training Program (NSTP). These kinds of national services, which are integrated with the respective educational systems of each country, are forms of service-learning. Service-learning may be defined as an approach integrating community services with instruction to apply what students have learned inside the classroom to the real world context in order to concretize learning and to strengthen civic and community responsibilities. Service learning is about hands-on participation in community-based projects. Based on Edgar Dale's Cone of Experience, the most effective methods involve direct, purposeful learning experiences, such as hands-on or field experiences (Anderson, n. d.). This emphasizes that learning from experience has a greater influence or impact on the lives of the students.

There are some studies conducted in other countries about the impacts of service learning to the students. The findings of these studies revealed that the impacts may be observed on their academic, civic or citizenship, and social or personal aspects. Furco's study (2002) showed that the service-learning group scored higher on all academic measures though the only statistically significant differences were between the service-learning and the no service group. National Service Knowledge Network (n. d.), revealed that the students who participated in the service-learning were found to be more cognitively engaged and more motivated to learn. In cognitive domains, training improves the quality of thinking and it involves problem solving, decision making, and explanation to achieve goals [Asia-Pacific Institute for Broadcasting Development (AIBD), 2012]. Studies show great promise for service-learning as an avenue for increasing achievement among alternative school students and other students considered at risk of school failure. Morgan and Streb's study (2001) demonstrated that service-learning projects with student leadership can help make students better citizens. Furthermore, as stated in the research conducted by Ammon, et al. (2001), the differences in impact were attributed to differences in programmatic goals; disparity in the ways in which attitudes changed; the ways in which previous service experiences were linked to civic engagement; and the differences in student thinking about good citizenship. A theory that will support this is the Gestalt theory which stimulates learning as experience and the experience as a source of learning (Lucas & Corpuz, 2011) because the argument of Ammon, et al. (2001) regarding the impact of service learning to the students discussed about the experiential learning of the students and how they learned from their experiences of service learning. Lastly, the authors of the study on the impacts on transition to adulthood (Martin, Neal, Kielsmeier, & Crossley, 2006), found that when compared to young people who were involved in service-only experiences, students who took part in service-learning reported more positive effects in their ability to help others, work well with other people, respect others, and see the world from other perspectives. Service-learning participants noted increased skills in communication, a heightened sense of self-confidence, and more sensitivity to differences in age, race, and economic status.

The NSTP (LAWPHiL, 2002) is a service rendered to one's own country with its aim of enhancing civic consciousness and defense preparedness in the youth by developing the ethics of service and patriotism while undergoing training in any of its three (3) program components in the Philippines. The following are the components of NSTP which are specially designed to enhance the youth's active contribution to the general welfare according to the Philippine

Republic Act No. 9163: (a) Reserve Officers' Training Corps (ROTC); (b) Civic Welfare Training Service (CWTS); and (c) Literacy Training Service (LTS). In Saint Louis University (SLU) where this study was conducted, CWTS and LTS were chosen to be part of NSTP based on the survey conducted in SLU to be part of NSTP; and because the two are very related to the nature of the school activities such as environmental and solid waste management, energy saving, medical and health missions, data processing, cultural presentation, research or survey, fitness and wellness are some to mention.

After ten years of its implementation in SLU, NSTP has already undergone a long journey. Hence, this study aimed to determine the effect of NSTP to the development of the students. It specifically sought to answer the following questions: (1) How effective were the NSTP courses for the Saint Louis University students? (2) What influences did NSTP courses provide the students along: (a) self-improvement; (b) performance; (c) community involvement; and (d) demonstration of competencies; and (3) What were the difficulties encountered by the students while enrolled in NSTP courses?

The theories that were used in this study are Transformative Learning theory and Dewey's Principle of Continuity. Mezirow's transformative learning theory focuses on how people make meaning of their experiences and, in particular, how significant learning and behavioral change often result from the way people make sense of ill structured problems, critical incidents, and/or ambiguous life events (Kiely, 2005). This theory is used to explain the impact of students' participation in community service programs in their holistic learning and development. John Dewey's Philosophy of Experience and Education presented the principle of continuity. The principle of continuity states, "delete all experiences are carried forward and influence future experiences," [International Centre for Educators' Learning Styles (ICELS), 2013]. Thus, this will tell that the learners who completed the NSTP courses will continue to apply and empower what they had learned from NSTP courses in their future activities.

The study is significant to the SLU-NSTP because it will help in evaluating whether the activities or service trainings they implement are molding the SLU students to be more competent, more creative, living by the Christian spirit, and more socially involved citizens of the country. The proposed study will also help the teachers, especially those teaching NSTP to make the learning of the students more experiential and stay with them for a long period.

Methodology

This study is a descriptive-survey type of research. According to Calmorin and Calmorin⁵ (2010), this type is suitable wherever the subjects vary among themselves and one is interested to know the extent to which different conditions and situations are obtained among these subjects. Particularly, the focus of the study is to determine the influence of NSTP activities to the holistic development of undergraduate students of Saint Louis University and the difficulties they encountered while enrolled in both courses of NSTP.

The respondent of this study were the undergraduate students per school of Saint Louis University, specifically from School of Accountancy and Business Management (SABM), School of Computing and Information Sciences (SCIS), School of Engineering and Architecture (SEA), School of Natural Sciences (SNS), School of Humanities (SOH), School of Nursing (SON), and School of Teacher Education (STE), who have completed NSTP 1 and 2 courses last academic year, 2012-2013. The exact number and list of full names of students who completed the said courses were obtained from the Registrar's Office with the permission of Dr. Gaston P. Kibiten, Director of Research, Extension, and Publications Office of Saint Louis University. The total population of the respondents of the study is 4734 students. The sample population of the

respondents was computed by multiplying the total population to 0.30. By doing so, the researchers obtained a sample population of 1421 student respondents. The total population of each school was also multiplied to 0.30. According to Dierckx⁷ (2013), 20% response rate is already considered as a good response rate. Hence, having a 30% response rate is considered to be very good. The computed sample population of each school was totaled and the result is equal to 1421 respondents. Table 1 shows the data on how many student respondents were taken from each school of the university.

Table 1. Number of Students who have Completed NSTP 1 and 2 last A.Y. 2012-2013

School	Number of Students who have Finished NSTP 1 and 2	Sample
School of Accountancy and Business Management	1458	437
School of Computing and Information Sciences	231	69
School of Engineering and Architecture	1016	305
School of Natural Sciences	899	270
School of Humanities	482	145
School of Nursing	509	153
School of Teacher Education	139	42
Total	4734	1421

Since the student respondents from each school, except SON, belong to different fields of specialization, the study utilized the cluster sampling. In cluster sampling, cluster, i.e., a group of population elements, constitutes the sampling unit, instead of a single element of the population (Ahmed, 2009)¹. Utilizing the cluster sampling technique, the respondents from each school were grouped according to their fields of specialization and the computed sample respondents from each field of specialization were given the questionnaires.

The study utilized a survey-type questionnaire adapted from Cancino⁶ (2009) as the primary tool in gathering data needed in the study but for the purpose of the study, the researchers changed the options moderately agree to agree to an extent and moderately disagree to disagree to an extent and the options very much to much and very, very much to very much and the researchers made the number of options from 5 to 4 to make it even. The questionnaire is composed of two main sections. The first section of the questionnaire requires the students to reflect on the extent of the influences of NSTP to the different aspects of their lives as individuals and as students. The second section is all about the frequency of difficulties encountered by the students while they were enrolled in each courses of NSTP respectively.

The questionnaires were administered last October to December, 2013. The researchers finished administering the questionnaires and made sure that those questionnaires with incomplete answers were considered as void. The researchers also followed the total number of sample respondents. After administering and checking the questionnaires whether it is void or not, the researchers tallied the data using the Microsoft Excel. The comments or suggestions of the respondents were also encoded in MS Word.

The choices for the effectiveness of NSTP courses were given scores as follows: 1 (Strongly Disagree); 2 (Disagree to an Extent); 3 (Agree to an Extent); and 4 (Strongly Agree). For the influences of NSTP courses along the self-improvement, performance, and demonstration of competencies of the students, they were given points as follows: 1 (To a Negative Extent); 2 (To No Extent); 3 (To a Moderate Extent); and 4 (To a Great Extent). Meanwhile, for the influences of NSTP courses along the community involvement of the students, they were given scores as follows: 1 (Not at all); 2 (A little); 3 (Much); and 4 (Very Much). For the difficulties encountered by the students while enrolled in NSTP 1 and 2, the choices were given points as follows: 1 (Never Experienced); 2 (Seldom Experienced); 3 (Often Experienced); and 4 (Always

Experienced). The results of the study were computed using the weighted mean in Microsoft Excel. For the effectiveness of NSTP courses, the computed numerical values were given interpretations as follows: 1.00-1.75 (Strongly Disagree); 1.76-2.50 (Disagree to an Extent); 2.56-3.25 (Agree to an Extent); and 3.26-4.00 (Strongly Agree). Meanwhile the influences of NSTP courses along the self-improvement, performance, and demonstration of competencies of the students were interpreted as follows: 1.00-1.75 (To a Negative Extent); 1.76-2.50 (To No Extent); 2.56-3.25 (To a Moderate Extent); 3.26-4.00 (To a Great Extent). As for the influences of NSTP courses along the community involvement of the students, the results were interpreted as follows: 1.00-1.75 (Not at all); 1.76-2.50 (A little); 2.56-3.25 (Much); and 3.26-4.00 (Very Much). Lastly, for the difficulties encountered by the students while enrolled in both NSTP courses, the results were interpreted as follows: 1.00-1.75 (Never Experienced); 1.76-2.50 (Seldom Experienced); 2.56-3.25 (Often Experienced); and 3.26-4.00 (Always Experienced).

Follow-up informal interviews were conducted with Mr. Albert Guinguino Jr., Mr. Ulysis Binalit and Mrs. Charmaine Mendoza after interpreting the findings of the study. They were chosen to be interviewed because Mr. Albert Guinguino Jr. is the coordinator of the SLU-NSTP while Mr. Ulysis Binalit and Ms. Charmaine Mendoza are two of the instructors of NSTP in SLU. The individual interviews were conducted last February 2014 with their permission to record the entire interview sessions using a voice recorder. To integrate what had been transpired in the interviews in the findings, the researchers assigned Instructor 1 to Mr. Guinguino, Instructor 2 to Mr. Binalit, and Instructor 3 to Ms. Mendoza to avoid confusions in the explanations.

Findings

Effectiveness of NSTP courses

Table 2. Effectiveness of NSTP courses

Question	School						
	SABM	SCIS	SEA	SNS	SOH	SON	STE
a. The instruction was effective. Most of what I learned was useful to me in my own life.	2.68	3.07	2.97	3.24	2.83	3.26	3.02
b. The course addressed the leadership skills I needed for community service and I saw how my work helped others.	2.87	3.16	3.01	3.25	2.88	3.25	3.19
c. The course provided opportunity for my career development because I developed new skills.	2.72	3.03	2.89	3.15	2.75	3.22	2.93
d. The course enhanced my personal life, I can make a difference using the knowledge and skills I acquired in NSTP.	2.53	3.09	2.90	3.13	2.80	3.14	2.98
e. The course allowed me to learn and solve some of the problems that community faces.	2.70	3.10	2.93	3.13	2.84	3.19	3.07
f. The course met my expectations.	2.22	2.72	2.75	2.97	2.39	2.99	2.86
Weighted Mean	2.62	3.03	2.91	3.15	2.75	3.18	3.01

Table 2 shows the effectiveness of NSTP courses. The numerical values have corresponding meaning of: Strongly Disagree (1.00 -1.75); Disagree to an Extent (1.76 – 2.50); Agree to an Extent (2.51 – 3.25); and Strongly Agree (3.26 – 4.00).

The study found out that the NSTP courses are effective courses as evidenced by the general weighted mean of all the undergraduate schools which fall under the "Agree to an Extent" category. School of Nursing has the highest weighted of 3.26 on the effectiveness of NSTP instruction, which falls under the "Strongly Agree" category. This is so because according to Instructor 2, they used the Filipino language to teach NSTP so that even the Filipino-American students will also be able to learn how to speak the language. Furthermore, the highest weighted mean of SABM, SCIS, SEA, SNS, SOH, and STE is on the item wherein the NSTP addressed the leadership skills that the students needed. To support this, according to Instructor 3, "Sometimes

we do discussion, sometimes we do collaborative activities at the same time we are learner-centered. In an NSTP class, we see to it that everybody is participating. We see to it that there is every leader in a group and that everyone is given the chance to become a leader since they are one group.” In addition, all of the students agreed to an extent that the NSTP courses met their expectations except for the respondents from SABM and SOH. Instructor 3 inferred that the students expected that NSTP courses are more of academic. In addition, he inferred that students expected that NSTP courses are only paper works but at the end, they realized that they were evaluated according to their performances. Furthermore, Instructor 3 said, “They must suppose to expect, as a Louisian, the moment they enroll in SLU and until lifetime as a Lousian you must always be involved in community welfare because that is one of the trademarks of a Louisian.”

Influences of NSTP along the self-improvement of the students

Table 3. Influences of NSTP along the self-improvement of the students

Questions	School						
	SABM	SCIS	SEA	SNS	SOH	SON	STE
a. Learned more about leadership	2.92	3.32	3.10	3.21	2.97	3.31	3.21
b. Developed myself professionally	2.62	3.09	2.99	3.23	2.86	3.23	3.19
c. Improved my academic performance.	2.51	2.96	2.73	3.02	2.61	3.12	2.95
d. Enhanced my chances for academic promotion	2.49	2.84	2.77	3.00	2.58	3.07	2.95
e. Connected with other students and communities	2.87	3.22	3.13	3.29	3.19	3.31	3.52
f. Improved my self-confidence	2.77	3.20	2.96	3.09	2.90	3.24	3.14
Weighted Mean	2.70	3.10	2.95	3.14	2.85	3.21	3.16

Table 3 shows the influences of NSTP courses along the self-improvement of students. The numerical values have corresponding meaning of: To a Negative Extent (1.00 – 1.75); To No Extent (1.76 – 2.50); To a Moderate Extent (2.51 – 3.25); and To a Great Extent (3.26 – 4.00).

The NSTP courses influenced the self-improvement of the students positively as evidenced by the general weighted mean of all the schools which fall under the "To a Moderate Extent" category. According to Instructor 3 NSTP students are exposed to different activities, different situations, and different people that serve as stimuli for them to react to and to know more about their own personalities. He added that these stimuli serve as opportunities for the students to get to know about themselves, their potentials, their strengths, their opportunities, their weaknesses and other threats to themselves. Knowing those opportunities, the students will be motivated to do something about their strengths, weaknesses, and opportunities. Instructor 2 also added that there are activities done in the NSTP that require students to evaluate one another. In that sense, the students will know what to improve more about themselves.

The highest weighted means of SABM and SCIS, 2.92 and 3.32 respectively, are on the item about "Learned more about leadership". To support this, Instructor 3 said that it is very important that they always do collaborative activities because in that way, they can see to it that the learners do their part not just the teacher. She even added that it is their concern to see to it that everybody is given equal opportunity to participate, express their ideas, thoughts, and feelings so that they will have a better exposure. On one hand, SEA, SNS, SOH, and STE were able to connect with other students and communities as evidenced by their highest computed weighted means of 3.13, 3.29, 3.19, and 3.52 respectively. This is so because according to Instructor 3, they have immersion. The immersion she referred to can be in the form of alternative activity like going to the Buyog watershed to do a community activity wherein they can also experience dealing with

other people. She added that by dealing with other people, they can observe the important things that people in that area are doing so that they will imitate the good deeds they have observed. However, SON respondents learned more about leadership and connected with other students and communities through NSTP as denoted by their highest computed weighted mean of 3.31.

Influences of NSTP along the performance of the students

Table 4. Influences of NSTP along the performance of students

Questions	School						
	SABM	SCIS	SEA	SNS	SOH	SON	STE
a. I was able to perform community service better.	2.92	3.26	3.08	3.27	2.97	3.36	3.19
b. My career advanced after completing the course.	2.66	2.83	2.77	3.09	2.70	3.11	3.00
c. I was motivated to serve marginalized population.	2.72	2.87	2.79	3.15	2.81	3.26	3.00
d. I became more committed to services in the community.	2.74	3.04	2.82	3.13	2.84	3.25	3.07
e. My understanding of leadership and community development increased.	2.75	3.26	2.98	3.19	3.01	3.34	3.12
f. I gained a network for leadership and community service information and assistance.	2.55	3.06	2.92	3.13	2.87	3.27	2.95
Weighted Mean	2.72	3.05	2.89	3.16	2.87	3.27	3.06

Table 4 shows the influences of NSTP courses along the performance of the students. The numerical values have corresponding meaning of: To a Negative Extent (1.00 – 1.75); To No Extent (1.76 – 2.50); To a Moderate Extent (2.51 – 3.25); and To a Great Extent (3.26 – 4.00).

The study found out that the NSTP courses have positive influences along the performance of the students which is evident on the general weighted means of all the schools. SABM, SEA, SNS, SON, and STE have their highest weighted means on the item on performing community service better. Their highest computed weighted means are 2.92, 3.08, 3.27, 3.36, and 3.19 respectively. This is so because according to Instructor 1 "Their exposure also to community projects, community activities will help them realize their passion because in some of the NSTP projects, students are allowed to choose a project and the projects we prepared are practically aligned to their courses." Instructor 3 added that in community service, there is a spirit of volunteerism and if one is concerned about the community, one should be sensitive.

However, the highest computed weighted value of SOH respondents is on the item on the increased of understanding of leadership and community development, which is signified by the computed weighted value of 3.01. In the interview conducted, Instructor 3 said that leadership should start from themselves. She even added that if the students see that the NSTP instructor is very dedicated and passionate in his or her profession, that instructor will serve as role model for them to follow. Meanwhile, the highest computed weighted mean of SCIS, which is 3.26, imply that they were able to perform community service better and increase their understanding of leadership and community development.

Influences of NSTP along the community involvement of the students

Table 5. Influences of NSTP along the community involvement of the students

Questions	School						
	SABM	SCIS	SEA	SNS	SOH	SON	STE
a. Identify what improvements are to be made to the situation of the target group.	2.81	3.00	2.93	3.13	2.86	3.15	2.93
b. Identify what changes are to be made to the target groups' actions.	2.82	3.00	2.82	3.09	2.78	3.14	2.95
c. Identify what results will be needed to generate specific impact.	2.79	2.96	2.84	3.10	2.80	3.07	3.00
d. Identify what activities must be done to obtain specific outputs.	2.76	2.94	2.93	3.15	2.87	3.08	2.98
e. Identify what human, material, and financial resources are needed to perform the activities.	2.89	3.04	2.94	3.10	2.86	3.11	2.98
f. Recognize that impacts and results have been achieved.	2.69	2.99	2.85	3.04	2.88	3.14	2.88
Weighted Mean	2.79	2.99	2.88	3.10	2.84	3.11	2.95

Table 5 shows the influences of NSTP courses along the community involvement of the students. The numerical values have corresponding meaning of: Not at all (1.00-1.75); A little (1.76 – 2.50); Much (2.56-3.25); and Very much (3.26-4.00).

The NSTP courses have positive influences along the community involvement of the students as evidenced by the general weighted means of all the schools. To support this community involvement of the students, Instructor 1 said, “We have two parts, the first part is classroom dynamics. We simulate. We have simulations. We have role playing. We have field visits. We have film viewing. We have forum. We have lectures. We have involvement in activities like the Panagbenga, like the other fun runs, and etc. The second cluster is they engage themselves in the different projects that we have. They will plant. They will manage. They will implement in the particular projects and also they work as group/ team so that early on they develop their sense of humor.”

SABM, SCIS, and SEA were able to identify what human, material, and financial resources are needed to perform the activities, as evident by their highest computed weighted values of 2.89, 3.04, and 2.94 respectively. In the informal interview conducted, Instructor 3 said, “When we speak of material, we can include the cultural festival because they are going back to their own culture. What available resources can they present in order to uplift their own culture?” Meanwhile, SNS respondents were able to identify what activities must be done to obtain specific outputs, as evident by their highest computed weighted mean of 3.15. According to Instructor 3, in NSTP classes they use the fish bone analysis wherein they will identify the top 10 problems in the society and they will analyze the causes of those problems. After which, they propose possible solutions or activities to solve the problems.

Meanwhile, NSTP influenced the community involvement of the SOH students because they can recognize that they have achieved impacts and results after conducting community services, as evident on the highest computed value of 2.88. In the case of SON, the results signify that NSTP courses were able to influence their community involvement enabling them to identify what improvements are to be made to the situation of the target group, which is evidenced by their highest computed weighted mean of 3.15. The explanation in the conducted interview is the same with the explanation of the fish bowl analysis. Lastly, NSTP courses influenced the community involvement of the STE respondents by enabling them to identify what results will be needed to generate specific impact. This is based on their highest computed weighted mean of 3.00.

Influences of NSTP along the demonstration of competencies of the students

Table 6. Influences of NSTP along the demonstration of competencies of the students

Questions	School						
	SABM	SCIS	SEA	SNS	SOH	SON	STE
a. Take responsibility for changing personal behaviors or acquiring skills that lead to personal, academic and community development success.	2.91	3.14	3.06	3.15	2.98	3.16	3.19
b. Demonstrate techniques in making community analysis.	2.85	3.06	2.95	3.03	2.90	3.12	2.95
c. Demonstrate ability to create and execute effective community development plan and take responsibility for outcomes.	2.62	3.13	2.97	3.05	2.88	3.14	2.98
d. Develop a clearer understanding of personal, social, and civic responsibilities by acting on accurate information to improve community health.	2.78	3.10	2.98	3.07	2.99	3.15	3.24
e. Generate and manage resources to support community development projects.	2.76	3.19	2.95	3.12	3.00	3.08	2.98
f. Demonstrate a local perspective that includes knowledge of and comfort with all dimensions of culture.	2.78	3.09	2.98	3.10	2.92	3.12	3.02
g. Present information, concepts on environmental issues and develop conservation programs.	2.60	3.06	2.96	3.04	2.98	3.12	3.05
h. Understand basic economic activities and how they influence the community and help in the development or improvement.	2.71	3.06	2.96	3.04	2.86	3.09	3.10
i. Understand effective leadership styles, key concepts of group dynamics, team and individual decision-making, the benefits of workplace diversity and conflict resolution.	2.78	3.29	3.05	3.29	2.99	3.25	3.19
j. Present information, concepts on literacy issues and develop programs.	2.68	3.07	2.92	3.21	2.90	3.11	2.86
k. Employ a wide range of writing strategies and processes to generate and present community profile and indicator.	2.63	2.94	2.93	3.12	2.79	3.05	2.88
l. Demonstrate and apply monitoring and evaluation concepts in community analysis report.	2.55	2.86	2.95	3.16	2.81	2.98	2.90
m. Locate, evaluate, and cite information to support a community analysis report.	2.56	2.97	2.97	3.13	2.82	3.02	2.93
n. Analyze systems of power and oppression.	2.69	2.97	2.86	3.07	2.82	3.10	2.95
o. Act on convictions and stand up for beliefs.	2.76	3.01	2.89	3.09	2.92	3.12	3.10
p. Examine how decisions are made and weigh the probable consequences of actions.	2.75	3.04	2.95	3.15	2.95	3.11	3.02
Weighted Mean	2.71	3.06	2.96	3.11	2.91	3.11	3.02

Table 6 shows the influences of NSTP courses along the demonstration of competencies by the students after completing the courses. The numerical values have corresponding meaning of: To a Negative Extent (1.00 – 1.75); To No Extent (1.76 – 2.50); To a Moderate Extent (2.51 – 3.25); and To a Great Extent (3.26 – 4.00).

The NSTP courses also have positive influences along the demonstration of competencies by the students as evident on the general weighted mean of all the schools. The findings revealed that they can demonstrate the competencies they have acquired or developed in NSTP even after completing the course. Moreover, the highest computed weighted means of SABM and SEA, which is 2.91 and 3.06 respectively, reveal that they can take the responsibility to change personal behaviors or acquire skills that will lead to personal, academic, and community development success. To support this, Instructor 3 said, “In order to increase their skills and abilities, we have what we call research and instruction.” She added that through research, together with the use modern technology, students can enhance their skills. NSTP instructors are providing more realistic technology based activities. If the students were not able to attend forums, they were given the chance to complete the alternative activities given to them. In that way the students acquire skills like planting, watering the plants, and the like which will add not only to their writing, speaking and listening skills but also in all of their aspects.

Meanwhile, the findings on SCIS, SNS, and SON reveal that the students can understand effective leadership styles, key concepts of group dynamics, team and individual decision-making, the benefits of workplace diversity and conflict resolution, which is evidenced by their highest computed weighted means of 3.29 for both SCIS and SNS, and 3.25 for SON. Furthermore, the highest computed mean of SOH, which is 3.00, denotes that they can generate and manage resources to support community development projects even after completing the course. Lastly, the highest computed weighted mean of STE reveals that the pre-service teachers are still able to

demonstrate the competency on developing a clearer understanding of personal, social, and civic responsibilities by acting on accurate information to improve community health, as indicated by their highest computed weighted mean of 3.24. This is so because according to Instructor 3, “It only goes through providing them meaningful learning. Here in NSTP, we see to it that every module targets the specific needs of every students.”

Difficulties encountered by the students while in Enrolled in NSTP courses

Table 7. Difficulties encountered by the students while enrolled in NSTP 1

Questions	School						
	SABM	SCIS	SEA	SNS	SOH	SON	STE
a. Mismanagement of Time	2.08	2.88	2.88	2.99	3.01	2.24	2.79
b. Attending remedial classes	2.37	2.90	2.44	2.51	2.51	2.46	2.33
c. Financial problems due to requirements	2.49	2.87	2.68	2.60	2.50	2.43	2.76
d. Completion of requirements	2.35	2.61	2.97	2.89	3.16	2.28	2.95
e. Obtaining the signatures of authorized signatories	2.24	2.45	2.98	2.90	3.23	2.38	3.14
f. Difficulties in going to the assigned classroom	2.68	3.01	2.62	2.63	2.74	2.58	2.69
g. Difficulties in adapting to non-permanent instructors	2.62	2.91	2.54	2.60	2.50	2.62	2.52
h. Wearing of complete uniform	2.34	2.77	2.86	2.69	3.02	2.44	2.83
i. Disagreements among group members	2.25	2.78	2.75	2.73	2.86	2.40	2.74
j. Difficulties in going to the assigned venues of the activities	2.29	2.86	2.73	2.67	2.85	2.54	2.79
k. Encountering activities without tangible importance	2.36	2.78	2.78	2.56	2.91	2.50	2.52
Weighted Mean	2.37	2.80	2.75	2.71	2.88	2.44	2.73

Table 7 shows the difficulties encountered by the students while enrolled in NSTP 1. The numerical values have corresponding meaning of: Never Experienced (1.00 – 1.75); Seldom Experienced (1.76 – 2.50); Often Experienced (2.51 – 3.25); and Always Experienced (3.26 – 4.00).

Table 8. Difficulties encountered by the students while enrolled in NSTP 2

Questions	School						
	SABM	SCIS	SEA	SNS	SOH	SON	STE
a. Mismanagement of Time	1.99	2.49	2.93	3.02	3.01	2.24	2.60
b. Attending Sunday activities	2.19	2.70	2.85	2.87	3.21	2.35	2.88
c. Financial problems due to requirements	2.47	2.83	2.76	2.64	3.03	2.38	2.79
d. Completion of requirements	2.27	2.55	2.95	2.93	3.23	2.35	3.02
e. Obtaining the signatures of authorized signatories	2.30	2.48	2.96	2.91	3.26	2.31	2.95
f. Transportation from one campus to another	2.23	2.80	2.78	2.70	2.96	2.52	2.81
g. Committing to the assigned activities	2.28	2.59	2.83	2.77	3.17	2.35	2.93
h. Wearing of complete uniform	2.34	2.61	2.83	2.76	3.05	2.39	2.60
i. Completing the required hours of duty.	2.29	2.58	2.86	2.83	3.12	2.42	2.93
j. Difficulties in going to the assigned venues of the activities	2.39	2.78	2.80	2.68	3.08	2.60	2.67
k. Encountering activities without tangible importance	2.44	2.70	2.79	2.58	3.12	2.59	2.64
Weighted Mean	2.29	2.65	2.85	2.79	3.11	2.41	2.80

Table 8 shows the difficulties encountered by the students while enrolled in NSTP 2. The numerical values have corresponding meaning of: Never Experienced (1.00 – 1.75); Seldom Experienced (1.76 – 2.50); Often Experienced (2.51 – 3.25); and Always Experienced (3.26 – 4.00).

It is evident on the study that the students encountered difficulties while enrolled in the NSTP courses. Among the difficulties that the respondents often encountered during their NSTP 1 were going to the assigned classroom, obtaining the signatures of authorized signatories, managing time wisely, and adapting to non-permanent instructors. However, in NSTP 2, the most often experienced or encountered by the students were financial problems due to requirements, obtaining the signatures of authorized signatories, managing their time, going to the assigned venues of the activities, and completion of requirements. Regarding the difficulty in going to the assigned classrooms, Instructor 3 defended the NSTP by saying that the students were aware about the date and venue of the NSTP class they enrolled into. She even asked why should they enroll into an NSTP class if they cannot commit or stand for it? On one hand, regarding the

difficulty in obtaining the signatures of authorized signatories encountered in both NSTP 1 and 2, Instructor 3 defended again the NSTP by saying that in the first place, they already explained that if the students are 18 years old and above, they can be the guardians of themselves. If not, they can ask for their relatives or landlords or landladies to be their guardians if their parents are not in Baguio City living with them.

Meanwhile, in defense of the NSTP regarding the difficulty in managing time wisely encountered by the students both in NSTP 1 and 2, Instructor 3 said that managing time wisely becomes a problem if the students do not exert their effort. In addition, Instructor 1 said that it is good if there is conflict in time so that the students will know what they should prioritize. Regarding the difficulty in adapting to non-permanent instructors, Instructor 3 said that it is inevitable that NSTP instructors will file maternity leave or sick leave and because of this, NSTP classes should be attended by substitute teachers. Students need to adjust if there are substitute NSTP instructors attending their NSTP classes. For the difficulty in going to the assigned venues of activities, Instructor 3 once again defended the NSTP by saying that they assign staffs to disseminate information about the activities through text message, Facebook, and email. She added that the problems occur if NSTP students were not informed earlier than the usual.

Conclusion

The study looked into the effectiveness of the NSTP courses as well as its influences along the self-improvement, performance, and community involvement of the students, as well as the demonstration of competencies even after finishing the course. Furthermore, the study also looked into the difficulties encountered by the students while enrolled in both NSTP 1 and 2.

However, it is to be noted that the study has its limitations. The study was conducted during the time when the student researchers were not yet done with the NSTP courses particularly the NSTP 2. Another limitation of the study was the interviews conducted. The interviews conducted were informal in nature that is why some of the results of the surveys were not answered directly.

Given the findings of the study, it is to be concluded that the NSTP courses are effective to an extent for the Saint Louis University students because the instruction was effective and it addressed the leadership skills needed by the students. Through effective community service provided by the NSTP courses, students developed holistically as individuals, as students, and as responsible citizens of the society and country guided by the four core values, which were instilled by the SLU-NSTP as well as the whole institution of Saint Louis University.

Aside from completing the courses, the students also gained benefits due to the community services they have done. They were able to improve themselves, performed better, involved more in the community, and demonstrated a lot of competencies even after completing the said service learning courses. The NSTP of Saint Louis University also influenced the students along self-improvement as evidenced by the findings that the students improved in terms of their leadership skills, academic and career aspects, connection with others and communities, and self-confidence. Meanwhile, there were also effects of NSTP along the performance of the students in terms of academic and community services. It is through the programs or activities provided by NSTP enabled the students to improve their performance. Since they were engaged in community services while enrolled in the NSTP courses, the students were able to improve their performance in every activity even in other subjects they enrolled. Furthermore, NSTP courses also had influences along the community involvement of the students because they were able to conduct community services wherein they identified what activities, changes, results, and resources are

needed to provide solutions to the existing problems in the society. In addition, students were able to recognize that they have made impacts or changes after they have conducted community services. It is through their experiences in NSTP courses that made them more involved in the community where they belong. The NSTP courses also had influences along the demonstration of competencies by the students even after completing the said courses. This in turn would agree to the principle of continuity by John Dewey which states "that all experiences are carried forward and influence future experiences," (ICELS, 2013).

Meanwhile, students also encountered difficulties while they were enrolled in NSTP 1 and 2. Along this, the difficulties often encountered by the students in NSTP 1 and 2 were the difficulties in obtaining the signatures of authorized signatories, going to the assigned classrooms and to the assigned venues of the activities, managing time wisely, and adapting to non-permanent instructors, and completion of requirements. The students also encountered financial problems due to the requirements in NSTP. Since the findings of the study indicate that most of the students from the different schools of Saint Louis University encountered difficulties while they were enrolled in NSTP courses, they were able to learn from those difficulties and due to those difficulties, the students were able to improve better as individuals, as students, and as citizens of the country. Encountering difficulties turned out to have positive effects to the students because those difficulties served as the avenues for the students to change for the better.

Given the results of the study regarding the effects of NSTP to the Saint Louis University students, the researchers recommend the future researchers to conduct further studies regarding the effects or benefits of NSTP to the students as well as to the community. Since the study found out that the students encountered difficulties while enrolled in the NSTP courses, future researchers should also study the difficulties encountered by the institutions in implementing a service learning program. Furthermore, some of the comments put by the respondents said that they want ROTC instead of NSTP and there is a heresy that when the Kto12 program will be implemented in the Philippines, boys will be mandated to enroll ROTC while girls will have an option whether they will enroll NSTP or ROTC. In addition, there is a recent issue regarding the call for abolishment of ROTC because of the hazing that happened in Polytechnic University of the Philippines. In line with this, the researchers recommending the future researchers to conduct a study regarding the perceptions of the students towards ROTC.

Acknowledgment

The research team would like to thank Dr. Gaston P. Kibiten for giving his permission to obtain the necessary data to make possible the research. Furthermore, we would also like to thank Mr. Bryan A. Hidalgo for being the statistician of the research team and Dr. Geraldine Wakat for rendering her service in editing the research paper. In addition, we would like to thank Mr. Albert Guinguino Jr., Mr. Ulysis Binalit, and Ms. Charmaine Mendoza for allowing us to conduct an interview with them to support the findings of the study. Lastly, the research team would also like to thank Mr. Laurence Balmeo and Ms. Fredeliz Villanueva for helping us gather the data for the research.

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The Effects of Mathematical Modelling on Students' Achievement-Meta-Analysis of Research

Andrzej Sokolowski

Abstract

Using meta-analytic techniques this study examined the effects of applying mathematical modelling to support student math knowledge acquisition at the high school and college levels. The research encompassed experimental studies published in peer-reviewed journals between January 1, 2000, and February 27, 2013. Such formulated orientation called for extracting individual effect sizes of student achievement from the accumulated research conducting a moderator analysis. A systematic review of literature resulted in locating 13 primary research articles involving 1,670 participants. The overall mean effect size; $ES = 0.69$ ($SE = 0.05$, 95% CI: 0.59–0.79) of a medium magnitude and positive direction supported the claim that mathematical modelling helps students understand and apply math concepts. A subsequent moderator analysis revealed differences of the effect sizes due to different modelling designs, aim of the modelling process, grade levels, and content domains. The research findings along with the discussion can be of interest to mathematics curriculum designers and practitioners who use modelling in their teaching practice.

Keywords: Mathematical modelling; Meta-analysis; Student achievement.

Introduction

Mathematical modelling (MM) is defined in literature in various ways; Pollak (2007) a precursor of introducing MM to school practice described modelling as a process of formulating a problem from outside of mathematics, understanding the problem, visualizing, and solving it. Lesh and Harel (2003) defined MM as an activity of finding quantifiable patterns of a phenomenon and its generalization. A more comprehensive description of MM was proposed by Confrey and Maloney (2007) who stated that MM is:

The process of encountering an indeterminate situation, problematizing it, and bringing inquiry, reasoning, and mathematical structures to bear to transform the situation. The modelling produces an outcome - a model - which is a description or a representation of the situation, drawn from the mathematical disciplines, in relation to the person's experience, which itself has changed through the modelling process (p.60).

MM as an educational development (Pollak, 1968) was initiated in engineering and sciences settings, and then spread to other fields. Its purpose was to elevate the gap between reasoning in a mathematics class and reasoning about a situation in the real world (Blum, Galbraith, Henn, & Niss, 2007). Situated in contexts, MM provides methods for analyzing data, formulating theories—often expressed in symbolic mathematical forms—and testing those theories as well as it helps with contextualizing problem solving processes. The process of MM can be exercised using various learning settings; from deductively arranged authentic problem modelling activities (e.g., English & Sriraman, 2010) to inductively organized inquiries leading the learners to formulating general patterns (e.g., Sokolowski & Rackly, 2011). Due to being context driven, knowledge acquisition by the processes of modelling plays a vital role in developing students' skills not only in mathematics classes but also in other disciplines, especially in sciences (Lesh & Harel, 2003; Wells, Hastens, & Swackhamer, 1995). As Confrey (2007) claimed “the strongest arguments for modelling are based on the view that it will be advantageous for the development of student thinking” (p.125) which is being accomplished by shifting the learning focus from finding unique solutions to enhancing skills of developing general solution processes through transforming and interpreting information, constructing models, and validating the models (Lim, Tso, & Lin, 2009). Through these processes, students learn math to “develop competency in applying mathematics and building mathematical models for areas and purposes that are extra — mathematical” (Niss, Blum, & Galbraith, 2007, p.5). Concerning the underlying learning theory, modelling is “based upon a constructive paradigm; hence, the assumption that learning is a self-regulated activity which cannot be controlled from the outside but which can be encouraged at best” (Hussmann, 2007, p. 344). This orientation requires the teacher to guide the students through MM processes not provide direct solutions.

Theoretical Background

Lingefjård (2007) stated that “mathematical modelling *is not* a body of mathematical knowledge but rather a collection of general principles which experience has proved to be helpful in the process of applying mathematical know-how to analyze problems” (p. 476). As an activity helping students apply the concepts of mathematics *outside* of mathematics classroom, MM is characterized by a unique structure called often modelling cycles (e.g., see Blum, 1996) and components.

Organization of modelling Activities and Mathematical Models

MM structure consists of several stages. Blum and Leiss (2007) proposed to following: understanding the problem (constructing), simplifying (structuring), mathematizing, working

mathematically, interpreting, validating and exposing. Transitioning through these stages involves observations, measurements, interactions - described together as data, coding systems, methods of sampling, and data collection (Confrey & Maloney, 2007). The process of MM can be supported by various means with a real experimentation to be the most common and recommended (Thomas & Young, 2011). Since conducting real experiments is difficult in mathematics classrooms—that are traditionally not designed for that purpose—there is a need for trying other means, for example computerized experiments. Podolefsky, Perkins, and Adams (2010) proved that virtual experiments can substitute for real experiments in science, thus their adoption for enhancing MM has become more tangible in contemporary math classrooms. While interactive software may serve as a means of providing new mathematical insight, Alsina (2007) warned that it cannot replace *learning by making*, which implies that while using interactive software students need to be given opportunities to manipulate on the system variables and then discover the underlying principles by themselves. While progressing through stages of MM, the learners can achieve multifaceted cognitive goals and consequently increase their competencies in applying math in other disciplines. MM activities not only provide opportunities for constructing models but they also expand students' views of mathematics by integrating it with other disciplines, especially sciences and engage students in the process of mathematization of real phenomena (Bleich, Ledford, Hawley, Polly, & Orrill, 2006).

The MM processes usually conclude with a formulation of mathematical representations called models—that are themselves key artifacts of the modelling processes (Confrey and Maloney, 2007). Elicited models are to be simplified, but accurate representations of some aspect of the real world (Winsberg, 2003). Models, can take various forms, ranging from three- to one-dimensional physical objects, statistical expressions—mainly in forms of *general linear models*—to algebraic and differential equations, all of which symbolize system variables and model their behavior. “The generic purpose of constructing and making use of a model is to understand problems seen in a broad sense, encompassing not only practical problems but also problems of a more intellectual nature that aim at designing parts of the real world” (Niss et al., 2007, p. 8).

Modelling at high school and college levels

MM can be exercised at any school level, yet the search undertaking for the purpose of this meta-analysis revealed that the majority of the research concentrates on high school and college levels. MM on these levels focuses the learners on “learning mathematics so as to *develop competency in applying mathematics and building mathematical models* for areas and purposes that are basically extra-mathematical” (Nish et al., 2007, p.5). Developing such competencies requires putting explicitly MM activities on the agenda of teaching and learning of mathematics. Research (Nish et al., 2007) shows that there is no automatic transfer of learned mathematics concepts to being able to apply them in real-life situations. MM activities possessing exploratory character are to help students make the transfer more adaptable to their experiences. The content for exercising modelling depends on the schooling level. While at the secondary level, students are introduced to modelling dynamic phenomena, at the university courses, students are expected to be able to use calculus to model given situations and produce analytical results from analyzing their models (Alsina, 2007). At the university level, modelling activities often constitute a separate course aimed at training pre-service teachers (Lingefjård, 2007). In addition to acquiring competencies, MM activities at university level “open an excellent opportunity for revising the traditional assessment of course work and written examinations and go into the fruitful collection of good assessment practices” (Alsina, 2007, p. 472). At both levels; high school and college, the activity of modelling will require students to coordinate results of applied inquiry and construct and justify formulated models (Confrey & Maloney, 2007).

Prior Research Findings

In supporting a need for this study, we searched for meta-analyses and other types of research syntheses on MM using ERIC (Ebsco), Educational Full Text (Wilson), Professional Development Collection, and ProQuest Educational Journals, as well as Science Direct and Google Scholar. Although several meta-analytic research studies aiming at various aspects of conceptualization of mathematical ideas were located, a meta-analysis specifically targeting research on MM or a synthesis of quantitative research was not found. A lack of such undertaking further supported a need for conducting this study.

Dekkers and Donatti (1981) in their meta-analysis focused on computing the effect of using computer simulations as a medium for enhancing instructional strategies. The findings gathered from 93 empirical studies “did not support the contention that simulated activities cause an increase of students’ cognitive development ($ES = -0.075$) when compared with other teaching strategies” (Dekkers & Donatti, 1981, p. 425). In light of these findings and to provide suggestions for further research, they suggested that “attention should be given to reporting details of methodology employed” (p. 426). The lack of promising results was associated with inadequate teaching methods that simulations were supposed to support. While summarizing effects of technology on creation of new environments for intellectual work in mathematics, Fey (1989) uncovered that technology, at that stage of development, was not helping students with graph interpretation, as was expected and suggested developing projects that will address and investigate eliminations of these difficulties. He also noted a need for a change in teachers’ perception regarding graph introduction—from teaching students “*how to produce a graph to focusing more on explanations and elaboration on what the graph is saying*” (p. 250). Another advantage of using computers in math education is their capability of creating micro-worlds that allows students to make changes in their environments (Balacheff & Kaput, 1996).

Quantification of learning effect sizes when the use of computer simulations were compared to traditional methods of learning was examined by Lee (1999), who meta-analyzed 19 empirical studies and concluded that they produced a moderate ($ES = 0.54$) learning effect size. Lee pointed out that “specific guidance in simulations helps students to perform better” (p. 81). In light of this finding, he advocated a need for placing more emphasis on the designing instructional support. A meta-analytic study conducted by Kulik (2003) who located 16 research studies published between 1990 and 2003 on the effectiveness of computerized exploratory environments in secondary schools revealed a moderate effect size of 0.32. This study did not provide further details on how the media of learning were embedded in the lesson cycles or discussed the design of instructional support. A substantial meta-analysis including studies published after 1990 was conducted by Li and Ma (2010) who extracted a total of 85 independent effect sizes from 46 primary studies representing all grades from elementary to senior secondary school. These researchers computed the effect sizes of the impact of computer technology on mathematics education in K-12 classrooms. The overall effect size of $ES = 0.28$ supported the claim that using technology in mathematics classes improves students’ achievements. A corresponding subgroup moderator analysis revealed that effect of using simulations ($ES = 1.32$) outpaced the effect of tutorials ($ES = 0.68$). They also investigated moderator effects such as the type of learning environment and found out that “using technology in school settings where teachers practiced constructivist approach to teaching produced the larger effects on students’ mathematics achievement than using technology in school setting where teachers practices traditional teaching methods” (Li & Ma, 2010, p. 234). This finding supports Confrey’s and Maloney’s (2007) thesis that “knowledge should be subjected to criteria of *functional fitness* that is akin to the constructivist concept of viability” (p. 58). In a similar vein, Hussmann (2007) argued that technology can support to situate in constructivist paradigm two important mathematical

objectives; “function construction contributing to building ideas, and function iteration that initiates a change of concept” (p.348). Other researchers focused on investigating more specific constructs. Legé (2007) found out that having students formulate mathematical models and then having them validate the models generates higher learning effects as opposed to having students use prearranged models (formulas). He further claimed that the difference is accounted for the degree of ownership in model enacting: students who were involved in formulating the models varied given key assumptions and linked the keys together using selection criteria, whereas students in the control group passively constructed their models based on a single consideration. Lingefjärd (2005) also concluded that after being immersed in MM activities, students handled word problems better than those taught by conventional methods. Research conducted by McBride and Silverman (1991) revealed that MM used during integrated lessons increased students’ achievement in all involved subjects, not only math.

Despite MM competencies being wider accepted as a part of mathematical literacy, modelling still faces unresolved issues that prevent the process of its conceptual framework design from solidifying. One such issue involves the stage of model validation. Zbiek and Conner (2006) suggested that students be given multiple opportunities to verify derived models. They also pointed out that MM supported only by pen-and-pencil might be lacking a reality aspect. Bleich and colleagues (2006) expressed concerns about inadequate teacher methodological preparation in inducing graphical representations of motion problems. A similar conclusion was reached by Sokolowski and Gonzalez y Gonzalez (2012) whose research revealed that teachers face obstacles in finding methodology that would help them guide the students through transitioning from observation to mathematization.

In sum, the major meta-analyses along with other research reported positive learning effects when MM was applied to enhance math learning objectives. Yet, the information associated with the type of instructional support that appears to be of high significance along with the extent to which contents from other disciplines should be induced into modelling activities is limited. This synthesis has also revealed that there are also unanswered questions regarding instrumental implementation of this learning method. By undertaking this study, we attempted to fill in the gap. The purpose of this meta-analysis was to synthesize peer-reviewed quantitative research findings on MM at the high school and college (tertiary) levels and search for ways of advancing the techniques of developing students’ modelling competencies. Although “*research in mathematics education* has shown that the success of the modelling approach in mathematics at tertiary level does exist” (Alsina, 2007, p. 473), a study that would quantify the effect sizes of larger pool of research has not been yet undertaken.

Research Methods

We undertook a meta-analysis developed by Glass (1976) as a research method because meta-analysis helps to (a) to integrate the findings of individual research to formulate more general inferences about the effects of heuristic techniques applied during MM activities (b) to address some of the limitations of the previous research by allowing for construct formulations and evaluation and (c) evaluate effectiveness of MM activates using larger research pool since such a method has not been found in the prior literature. Zawojewski (2010) identified two types of research objectives on MM: (a) development and evaluation of the models formulated by learners, and (b) instructional tools and learning media applied during the modelling activities. This research intended to examine the findings of the former; effectiveness of instructional tools and learning media. Furthermore, through undertaking subgroup moderator analysis and identifying conditions that generate the highest learning effects, we hoped to also formulate suggestions for improving students’ performance on MM tasks.

Research Questions

The formulation of the research questions was supported by (a) suggestions found in the prior literature, (b) development of contemporary views on the role of MM in school practice, and (c) the type of research methods employed. Intertwining these three venues, the following research questions were enacted:

1. What are the magnitude and direction of the learning effect size when the learning is situated in MM as compared to conventional methods of learning?
2. What are the moderators that affect students' achievement during modelling activities and what are their effect sizes?

Key Term Descriptions

The literature search was guided by the following operational terms: *mathematical modelling*, *model – eliciting activities*, *medium utilized for a model construction*, *mathematical model*, *experimental study*, and *effect size statistics*.

Mathematical modelling is a process of encountering a situation, problematizing it, and bringing inquiry, reasoning, and mathematical structures to transform the situation (Confrey and Maloney, 2007). Literature showed that the term mathematical modelling can describe two types of activity: translating the real— world system into mathematical terms for the purpose of solving a problem or for the purpose of analyzing a situation by applying various steps associated with accomplishing that goal (Gravemeijer, 1997). MM of both of these types of activities will be included in this study.

Model – eliciting activities (MEA) are defined as “problem solving activities that require students to express their current ways of thinking in forms that are tested and refined multiple times and that elicit a model” (Lesh & Yoon, 2007, p.162). In order to be termed MEA, an activity must satisfy six principles developed by Lesh and Kelly (2000): (1) the reality principle (2) the model construction principle (3) the self-assessment principle (4) the construct documentation principle (5) the model share-ability and reusability principle and (6) the simplicity principle.

Medium utilized for a model construction is defined as a form of information presented to the learners. The following are the possible media types: data tables, written text problems, computerized interactive simulations, or real experiments.

Model was operationally defined as a mathematical construct designed and formulated to study a particular real-world system or phenomenon (Confrey, 2007). Mathematical models can include, but are not limited to graphical, symbolic, and physical representations.

Experimental study is a type of research that seeks to determine whether an intervention had the intended casual effect on the participants. The following are the key components of an experimental study: (a) pre-posttest design (b) a treatment group and a control group and (c) random assignment of study participants (Shadish, Cook & Campbell, 2002).

Effect size statistics (ES) is a measure of strength of an outcome after treatment, in a form of MM was applied. ES was used to quantify student achievement in each of the located studies. The magnitude of the effect size was calculated using Hedge's (1992) formula.

$$g = \frac{\bar{x}_1 - \bar{x}_2}{s^*}, \text{ where}$$

\bar{x}_1 represents the posttest mean score of the treatment group (situated in modelling environment)

\bar{x}_2 represents the posttest mean score of the control group (taught by traditional methods)

$$s^* = \sqrt{\frac{(n_1 - 1)SD_1^2 + (n_2 - 1)SD_2^2}{n_1 + n_2 - 2}} \text{ represents coupled standard deviation; where}$$

n_1, n_2 represent the sample sizes of the control and treatment groups respectively and

SD_1, SD_2 represent standard deviations of treatment and control groups mean scores.

Effect size will be expressed numerically in a decimal form.

Data Collection Criteria

The research included only peer-reviewed studies published in journals because such studies represented methodologically high quality research (Lipsey & Wilson, 2000). Although bias against null findings cannot be completely removed even in peer-reviewed journals (Cooper, 2009) high quality research provides means of computing moderator effects that was also intended in this study. The initial search criteria was restricted to the following constraints: (a) time span which included papers published between January 1, 2000, and February 27, 2013; and (b) experimental research that provided means for calculating effect size statistics (c) level and subject of teaching; high school and college math courses and (d) MM as process to transform a situation into a model and analyze or solve it. The section that follows defines, in more details, descriptive and inferential parameters that were extracted from each study.

Descriptive and Inferential Parameters

Descriptive parameters encompassed the following: the grade level of the group under investigation, *the locale* where the studies were conducted, the sample size representing the number of subjects in experimental and control groups, the date of the study publication, the duration of the study, and the total time interval that the subjects were under treatment. The total treatment time was introduced due to a high diversity of treatment frequency; thus, for instance, if the study lasted 2 months and the treatment was applied twice a week for 3 hours each session, the reporting is depicted as 2 months/48 h. Inferential parameters included posttest mean scores of experimental and control groups along with their corresponding standard deviations. If these were not provided, F-ratios or t-statistics were recorded. Although most of the studies reported more than one effect size describing also other constructs than students' achievement (see e.g., Schoen & Hirsch, 2003; Wang, Vaughn, & Liu, 2011), the current study focused on reporting effects of student achievement only. As experimental groups were under treatment of mathematical modelling, control groups were taught by traditional methods.

Descriptions of groups and their classes

A total of 14 classes were formulated and grouped according to their descriptive purposes in Table 1. The classes were used for coding purposes.

Table 1. Summary of Groups and Their Classes

Group	Classes
Study general characteristics	Research authors School level (high school or college) Subject area (calculus, statistics, algebra or geometry) Locale of the research (country where the study was conducted) Year of publication (year when research was published) Type of publication (peer-reviewed)
Study methodological characteristics	Instrumentation (computer-supported activity or pen and paper) Reliability of measure (researcher-developed instrument (local) or standardized tests) Type of research (quantitative) Group assignment (randomized or quasi-experimental) Sample size (number of participants in control and experimental groups)
Study design characteristics	Program used, research specifications (verbal descriptions) Duration of treatment (in semesters, weeks, or days) Frequency of treatment assignment (in hours per day or other metrics provided) Medium for model construction (computer or context provided on paper) Learning setting (student centered)

In the process of collecting the research literature, ERIC (Ebsco), Educational Full Text (Wilson), Professional Development Collection, and ProQuest educational journals, as well as Science Direct, Google Scholar, and other resources available through the university library, were used. The initial search terms were defined reflecting formulation of classes focusing mainly on study methodological characteristics and design. The following terms were utilized to locate the relevant literature: *mathematical modelling*, *model eliciting activities*, *simulations*, *computers in mathematics*, *mathematics education*, *student achievement*, *high school*, *college*. These search criteria returned 241 articles. After a review, it was revealed that eight studies satisfied the inclusion criteria. Most of the rejected studies focused on examining formulated models in the professional fields of engineering or medicine. In order to increase the pool, a further search was undertaken with broader conceptual definitions. This search included auxiliary terms that were found in descriptions of mathematical modelling activities, such as *investigations in mathematics*, *techniques of problem solving*, *exploratory learning in mathematics*, and *computerized animations and learning*. These modifications returned 82 research papers. After an additional scrutiny, 5 studies were added to the pool. The validity of the coding and the extracted data was supported by a double research rating that constituted of two teams; the primary authors and another professional who reviewed extracted studies for their adherence to selection criteria. The double rating was applied at the initial and at the concluding stages of the study. Any discrepancies were resolved.

Research Analysis

A total of 13 primary studies were used in this meta-analysis with a total of 1,670 participants. We realized that to have the most accurate data along with most accurate inferences, the modelling activities would have to be coded according to the MEA principles as defined by Lesh and Kelly (2000). However, such extractions were not feasible, due to MEA principles not being converted into quantitative constructs in these studies. Table 2 summarizes the studies' features.

Table 2. General Characteristics of the Studies' Features

Authors	Date	Locale	RD	SS	School Level/ Subject	Research Duration/ Frequency	Learning Setting	Medium of Learning
Young, Ramsey, Georgiopoulos, Hagen, Geiger, Dagley-Falls, Islas, Lancey, Straney, Forde, & Bradbury	2011	USA	QE	265	College/Calculus	1 semester 1h/week	SC	Comp
Wang, Vaughn, & Liu	2011	Taiwan	QE	123	College/Statistics	1 semester NP	SC	Comp
Voskoglou & Buckley	2012	Greece	QE	90	College/Calculus	1 semester NP	SC	Comp
Laakso, Myller, & Korhonen	2009	Finland	R	75	College/Statistics	2 weeks 2h/week	SC	Comp
Milanovic, Takaci, & Milajic	2011	Serbia	QE	50	HS/Calculus	1 week 4.5h	SC	Comp
Baki, Kosa, & Guven	2011	Turkey	R	96	College/Geometry	1semester NP	SC	Comp
Bos	2009	USA	R	95	HS Algebra	8 days 55min/day	SC	Comp
Mousoulides, Christou, & Sriraman	2008	Cyprus	QE	90	HS Statistics and Geometry	3 months 3h	SC	Comp
Schoen & Hirsch	2003	USA	QE	341	HS Algebra	1 semester NP	SC	PP
Scheiter, Gerjets, & Schuh	2010	Germany	QE	32	HS Algebra	1 session 2h	SC	Comp
Eysink, de Jong, Berthold, Kolloffel, Opfermann, & Wouters	2009	The Netherlands and Germany	QE	272	HS Probability	1 week	SC	Comp
Bahmaei	2012	Iran	R	60	College/Calculus	1 semester 15 sessions	SC	PP
Baki & Guveli	2008	Turkey	QE/ MS	80	HS Algebra	1 semester NP	SC	Comp

Note. R = randomized, QE = quasi-experimental, RD = research design, SC = student centered, MS = mixed methods, Comp = computer, PP = pen and pencil, HS = high school, SS = sample size, NP = not provided.

The majority of the studies (9, or 70%) were designed as quasi-experimental, while 4 (30%) were randomized. The study durations ranged from 2 hours to 1semester. The average sample size for the study pool was 123 participants, with the highest of 272 participant conducted by Eysink and colleagues (2009) and the lowest sample of 32 students in a study by Milovanović and colleagues (2010). When categorized by school level, college and high school were uniformly represented, with six high school studies (or 46%) and seven college studies (or 54%). When categorized by

learning setting, all of the studies were student centered, meaning that students worked on deriving models for the given problems using the teachers' expertise only when needed. Such organized MM activities "provided students with opportunities to discuss employed strategies with each other, explore alternative solution pathways, interpret and evaluate the reasonableness of arguments and solutions and explain both results and reasoning to others" (Antonius, Haines, Hojgaard, Niss, & Burkhardt, 2007, p. 295). Model formulation was supported by using computerized simulations in 11 (or 85%) of the studies; two studies (or 15%) used the traditional pen-and-pencil approach.

Inferential Analysis

The inferential analysis of this study pool was initially performed using SPSS 21 (Statistical Package for the Social Sciences) software. We used the program to verify the homogeneity of the study pool, as suggested by Cooper (2009) and calculated the effect size for each study using posttest means on experimental and control groups, as suggested by Lipsey and Wilson (2001). Such standardized individual effect sizes were then corrected for population bias, and weighted as suggested by Hedges (1992). After weighted effect sizes were computed, the overall mean effect size statistic along with homogeneity statistics for the entire pool was calculated. The calculated homogeneity statistics ($Q_T = 329.74$, with $df = 16$, $p < 0.01$) indicated statistically significant variation of the effect sizes; thus, a random-effect model was adopted for further data analysis. These computations allowed for answering the first research question:

What are the magnitude and direction of the learning effect size when the learning is situated in MM as compared to conventional methods of learning?

The mean effect size for the 13 primary studies (14 primary effect sizes) was reported to have a magnitude of 0.69 ($SE = 0.05$). A 95% confidence interval around the overall mean— $C_{lower} = 0.59$ and $C_{upper} = 0.79$ —supported its significance (Hunter & Schmidt, 1990). The numerical value of the effect size of 0.69 is classified by Lipsey and Wilson (2000) as of a moderate size. Its positive direction indicated that the score of an average student in the experimental groups—who used MM to enhance problem-solving techniques—was 0.69 of standard deviation above the score of a student in the control groups, who was taught the same processes using traditional methods of instruction. One can claim that MM activities that involve rethinking the nature of givens and patterns and allow students' own ways of reasoning are more effective than traditional problem solving approaches that are characterized by Lesh and Yoon (2007) as getting from *pre-mathematized givens* to mathematical goals. Table 3 provides a summary of the individual effect sizes of the meta-analyzed studies along with their confidence intervals, standard errors, and general descriptions of the treatment and computer programs used as a medium for model eliciting.

Table 3. Effect Sizes of Applying Mathematical Modelling in High School and College

Study (First Author)	ES	SE	95% CI		Reliability of Measure Used	Program Used, Research Findings, Research Specifications
			Lower	Upper		
Bos (2009)	0.70	0.21	0.18	1.01	Standardized Texas state assessment. Kuder-Richardson formula 20 for reliability: $r_{pret} = .80$ and $r_{postt} = .90$.	TI Interactive Instructional environment.
Young (2011)	0.61	0.13	0.10	1.09	(UCF) university faculty Math Department tests. Inter-rater reliability: $r_{pret} = .82$ and $r_{postt} = .92$.	Research modelling activities (Excel) supported by computer.

Baki (2011)	0.81	0.26	0.09	1.11	PCVT test with KR-20 of $r_{\text{pret}} = .82$ and $r_{\text{pret}} = .80$ (Branoff, 1998).	Interactive geometry software.
Young (2011)	0.04	0.13	0.34	0.85	University (UCF) faculty Math Department tests. Reliability: $r_{\text{pre}} = .82$ and $r_{\text{post}} = .92$.	Research modelling activities (Excel) supported by computer.
Wang (2011)	0.45	0.26	0.08	1.11	Researcher-developed 20-item test, Conbach's $\alpha = .91$.	Developed dynamic computer program that modeled real situations to test hypothesis.
Voskoglou (2009)	0.49	0.22	0.17	1.03	Researcher-developed test graded by two faculty members.	Contextualized differential equations using computer programs.
Laakso (2009)	0.61	0.24	0.12	1.07	Researcher-developed test.	Trakla2 to have learners developed probability principles.
Milanovic (2010)	0.67	0.29	0.02	1.18	Researcher-developed test, items the same on both pretest and posttest.	Developed simulated program to evaluate integrals. Used Macromedia Flash 10.
Mousoulides (2008)	0.31	0.22	0.17	1.03	Researcher-developed test.	Researcher-designed activities aimed at various math model formulations.
Schoen (2003)	0.53	0.11	0.38	0.81	Standardized calculus readiness test items.	Developed new math curriculum that focused on modelling.
Scheiter (2010)	0.57	0.36	-0.14	1.33	Researcher-developed test aligned with Reed (1999) categorization.	Computer programs to enhance modelling through animated situations.
Eysink (2009)	4.49	0.12	0.35	0.84	Researcher-developed 44-item test. Reliability was determined by Cranach's $\alpha = .64$ and $\alpha = .82$.	Different multimedia settings to investigate the effect on students' math inquiry skills.
Bahmaei (2012)	1.84	0.26	0.07	1.13	Researcher-developed test items.	Researcher-developed activities.
Baki (2008)	0.43	0.23	0.14	1.05	Researcher-developed test items with reliability of $r_{\text{postt}} = .62$.	Web-based mathematics teaching material (WBMTM).

Note. ES = effect size, SE = standard error.

All meta-analyzed studies reported a positive effect size when MM activities were used. The highest effect size of $ES = 4.49$ was reported by Eysink and colleagues (2009), who investigated the effect of multimedia on students' modelling skills, and the lowest of $ES = 0.04$ was reported by Wang and colleagues (2011), who investigated the effect of using computerized programs to model differential equations. In order to support reliability of the assessment instrument, several researchers (e.g., Wang et al., 2011) applied the Crnobach's α - coefficient or Kruder – Richardson's formula 20 (KR20). A reliability coefficient of the assessment instrument was applied in six (or 46%) of the studies. Table 3 contains also additional information provided by the primary researchers that distinguish the applied medium within the study pool. In the majority of the studies, the modelling activities were supported by researcher-developed contexts. In order to identify potential moderators, the studies were further aggregated (see Table 4).

Analysis of Moderator Effects

The process of computing subgroup effects allowed for uncovering moderators that optimized the magnitude of the effect size statistic and to answer the second research question:

What are the moderators that affect students' achievement during modelling activities and what are their effect sizes?

A set of four moderators was identified: *school level*, *type of medium used for MM*, *length of treatment*, and *mathematics content domain*. This categorization resulted in 10 subgroups whose effects were individually computed and summarized in Table 4.

Table 4. Summary of Subgroups and their Weighted Effect Sizes

Moderators and Their Groups	N	ES	SE	95 % CI	
				Upper	Lower
<i>Grade Level</i>					
High school	7	0.94	0.07	0.79	1.08
College	7	0.45	0.08	0.30	0.61
<i>Medium Supporting MEA</i>					
Computer simulations	12	0.72	0.06	0.60	0.85
Pen and paper activities	2	0.68	0.10	0.48	0.88
<i>Treatment Duration</i>					
Semester	8	0.46	0.06	0.34	0.59
Shorter than one semester	6	1.31	0.10	0.11	1.50
<i>Content Domain</i>					
Algebra	4	0.73	0.09	0.55	0.91
Calculus	5	0.38	0.09	0.19	0.56
Probability and Statistics	4	3.11	1.17	3.11	3.80
Geometry	1	0.81	0.26	0.09	1.11

Note, N = number of participants, ES = effect size, SE = standard error.

The mathematical calculations of the moderators followed Cooper (2009), who suggested giving more weight to effect sizes with larger sample populations. Calculation of corresponding confidence intervals and standard errors were also enacted. The following sections provide a more detailed discussion of the identified moderators and their effect on student achievement.

The effect of the school level on student achievement

This block was created to mediate the effect sizes of students' achievement between the high school and college levels. Although it was intended to differentiate not only among high school grade levels but also among college majors, due to the limited pool of studies, this idea was aborted and two general group levels—high school and college—were formulated. The effect size showed differences; high school students reported a large effect size of $ES = 0.94$ ($SE = 0.07$), versus college-level reporting a moderate effect size of $ES = 0.45$ ($SE = 0.08$). This evidences that that high school students benefit more by being involved in modelling activities than college-level students and the difference can be accounted for other mediators (silent in these studies), such as the difference in difficulty level of high school and college mathematics courses or better acquaintance of high school students with modern computerized modelling media. As modelling is a relatively new mathematics learning method, some college students might find it difficult to alter their habits of considering mathematics as a subject of *drill and practice* to a subject that provides a basis for hypothesizing, explorations and opportunities for genuine applications. We hypothesize that a prior experience with modelling at lower school level might also have an impact on students' achievement at the college level. The data accumulated in the pool did not provide the basis for supporting such claim though. However, if the information were available, an additional moderator could be formulated and further computations conducted. Developing modelling skills and techniques that require solving higher-order problems that involve analyzing and synthesizing knowledge of multiple subject areas

requires certain time and effort. It seems though that the sooner developing such skills is initiated and brought forth, the sooner the learner will become acquainted and benefit from them.

The effect of medium used during MM activities on student achievement

Two learning media—computer simulations and written pen-and-pencil activities—were identified in the gathered pool. Computers were used in 12 (or 86 %) of the studies to support modelling activities, and written pen-and-pencil methods were used in two of these studies (or 14%). The learning effect size produced by simulations was higher ($ES = 0.72$, $SE = 0.06$) when compared to traditional pen-and-pencil activities ($ES = 0.68$, $SE = 0.10$), yet the difference was not that large. An advantage of computer simulations is their interactivity that allows to conveniently observing the system outputs due to manipulating on independent variable(s) (Scheiter et al., 2010) and also verifying derived model. The other advantage of using technology is engaging the learners in a new level of creative discovery that places them “in a situation where they naturally raise the question before being shown the result” (Pead, Ralph, & Muller, 2007, p. 315) which seemingly triggers revisions or consolidations of previously learned concepts. A word of caution must be placed here: the medium itself, as noted by Bos (2009), will not generate learning because concepts, principles, and ideas do not reside in physical materials or classroom activities but in what students actually do and experience. Kadijevich (2007) suggested to “view computers as tools that expand human mental function” (p. 352). As many students experience difficulties in transferring their knowledge from the mathematical world to real (e.g., see Crouch & Haines, 2004), technology according to Keune and Henning (2003), can help reduce such difficulties by enabling the students to concentrate and master the subtasks that cause the most difficulties in the transferring process. Careful inquiry planning coupled with availability of interactive media are the prerequisites for initiating students’ engagement and knowledge transfer. Research also shows (e.g., see Young et al., 2011) that providing students with too detailed descriptions of procedures without letting them explore and discover relations on their own is not an effective inquiry and a balance between what students input should be and the degree of provided guidance needs to be established and controlled. A relatively low pool of located pen-and pencil research (2, 14%) suggests that such modelling medium is diminishing from the research and more sophisticated computerized environments are being used.

The effect of the treatment length on student achievement

Two different classes were formulated to answer this question: one semester and shorter than one semester. At the college level, some of the research was designed using a platform of a MM lasting one semester that examined the effects of modelling activities embedded during the course (e.g., Voskoglou & Buckley, 2012). The time span for other research was shorter ranging from a 2 h (e.g., Scheiter et al., 2010) to 3 months 3 h per week (e.g., Mousoulides et al., 2010). The effect size computation for this subgroup showed that shorter treatments produced a higher effect of students’ achievement ($ES = 1.31$, $SE = 0.10$) than longer ($ES = 0.46$, $SE = 0.06$). The large effect size of $ES = 1.31$ that resulted primarily from computing the effect sizes of control groups taught by tightly choreographed traditional teaching methods and experimental using MM, supports the claim that providing students with opportunities for modelling problems where they “filter, interpret, relate, organize, or synthesize information” (Lesh & Yoon, 2007, p.169) brings positive effects in their learning even if such activities are shorter.

The effect mathematical content domain on student achievement

Four different domains were formulated for this subgroup: algebra, calculus, probability and statistics, and geometry. The frequency of studies in each level was highly dispersed, ranging

from one study that examined modelling the concepts of geometry to five studies that focused on modelling calculus concepts. According to computations, probability and statistics, generated the highest effect size ($ES = 3.11$, $SE = 1.17$). The magnitude of this effect size was inevitably affected by an outlier of 4.49 (Eysink et al., 2009). If this study were removed, the effect size would have been $ES = 0.21$, with $SE = 0.17$. Lakoma (2007) identified several steps of students' natural reasoning that lead them to developing stochastic concepts: "exploring a situation involving randomness, formulating a problem, creating a local model of the phenomenon, analyzing the mathematical model in order to solve the problem and comparing solutions obtained using the model with results of observations of the random phenomenon" (p. 391). The high effect indicates that students learn the concepts of probability and statistics more effectively when the concepts are modeled.

The concepts of algebra and its predominated domain — function analysis— produced a moderately high effect size of $ES = 0.73$. Mathematical functions are difficult for students because they can be perceived structurally, as objects, and operationally, as processes (Sfard, 1991). Modelling challenges the students to connect objects and processes of various function representations, thus one can hypothesize that this is one of the reasons that modelling effectively supports function understanding. The lowest effect size of $ES = 0.38$, $SE = 0.09$ in this subgroup was attributed to activities involving calculus concepts. As calculus is driven by a high diversity of function representations, a closer look at this result and searching for ways of improving it seems indispensable. It is expected at the university level, that "students are able to use calculus to model situations and hereby to be able to produce analytical results from analyzing models (Blomhøj & Jensen, 2007, p. 52). The task of model formulation, for instance differential equations (e.g., Milovanović et al., 2011) that are typically initiated by identifying a rate of change are poised to have bifocal difficulties; they require a deep understanding of principles of the underlying contexts and familiarity with various structures of differential equations.

As modelling is to promote better understanding of all involved subjects, not only its mathematical part, teachers need to be prepared to "help students clarify a real problem, generate and select variables, setup conditions appropriately and confidently [...] and promote positive affective contexts about mathematics and the problem domain" (Kadijevich, 2007, p. 349). Knowledge of sciences as well as of other academia is required to be possessed by mathematics teachers to successfully lead students through the process of identifying embedded principles. Calculus, as a study of change and accumulation, provides a wide range of sophisticated apparatus for inducing mathematical modelling activities, but it seems that heuristic techniques applied during modelling calculus concepts can be revisited to better reflect students' needs and their experiences. While the focus of the current research is on applying MM to problem solving, attempts to use MM to model concept introduction such as, for example function differentiability, or the first fundamental theorem of calculus seem as suggestions for further research to improve the effects of MM on students achievement in calculus. It is hypothesized that introducing calculus concepts in contexts will simultaneously provide students with ample application examples thereby making the underlying theorems more related to students' prior experiences.

Summary and concluding remarks

Accumulating all of the inferences, it is concluded that modelling activities generate positive learning effects when compared to traditional teaching methods at high school and college levels in any content domain. As "a number of empirical and international comparative studies indicate that applications and modelling are less significant in everyday school life in many countries" (Kaiser & Maaß, 2007, p. 99), this study provides a robust support for a wider implementation of

modelling to mathematical school practice as a support of students' mathematical learning through modelling activities as well as the development of students' modelling competencies.

A subsequent moderator analysis revealed that among the collected pool of studies, the setting that produces the most optimal learning effects is short activities conducted at a high school level supported by computer simulations as a medium for modelling. While real-world contexts provide legitimate sources for introduction of MM activities (Niss et al., 2007), more work needs to be done in bringing forth the heuristic techniques that MM has to offer such as "creating interplay between the real world and mathematics toward more realistic and less stereotyped problem situations and [...] changing teachers' conceptions, beliefs and attitudes and change classroom culture by establishing new socio-mathematical norms" (Bonotto, 2007, p. 186).

This study uncovered also several concerns regarding domain specific instructional support that would guide the students through reasoning and firm their MM competencies (e.g., see Lim et al., 2009, Mousoulides et al., 2008). In school practice "the activity of modelling is a way to highlight a mathematical topic" (Makar & Confrey, 2007, p. 490) rather than focus on inferences that derived models can provide. Such organized activities might not benefit the learners in fully because they support "*realizing mathematics* –by pinpointing out applications of ideas and skills that are introduced [...] not *mathematizing reality*" (Lesh & Yonn, 2007, p. 163). Since the goal of teaching mathematics today is to treat it as a language for communication and as a tool for predictions and explanations of reality (Freudenthal, 1983), there is a need to place more emphasis on the context and have the learner focus first on the underlined principles before attempting to translate it in a mathematical model. These concerns suggest pathways for further studies focusing on merging students reasoning skills learned in other subjects (e.g., sciences) in a unified comprehensive MM process.

If mathematics is to be taught as a language of communications, the learners need to be provided with directions on how to relate behaviors of variables of a given scenario with properties of specific functions. For example, students would need to realize that periodic occurrences will most likely be modeled by sinusoidal functions for which to know period of occurrence along with a maximum or minimum value is required (e.g., see Sokolowski & Rackly, 2011) or that two dimensional motion requires consideration of parametric equations. Students' familiarity with functions properties are important initial steps toward mastering modelling competencies but their skills to relate identified contexts principles with a corresponding function properties are anticipated to benefit the learner even more, especially at the high school and college levels.

Other suggestions for further research, that materialized might focus on (a) investigating the effect of MM on eliminating students' science and mathematics misconceptions and (b) the degree to which math modelling activities should be contextualized, whether MM should be limited to formulating mathematical representations or should it be perceived as a bridge linking mathematics with other academia and provide more opportunities for scientific investigations.

We are aware of certain factors limiting the study findings, one of which was the number of located primary studies and the aim that focused only on quantitative. While we focused on collecting available peer-reviewed studies published in journals, we realized that perhaps opening the research to other types of reports such as books, dissertations, technical reports, unpublished manuscript, conference proceedings and the like would increase the pool and consequently the significance of study findings. Extending the search criteria is suggested as an avenue for a further study along with conducting a parallel meta-synthesis of qualitative research. Another factor justifying the limited count of studies is the virtue of modelling that is not widely exercised in school practice yet despite its proven positive effects. However as this research showed, its

popularity is gaining momentum; 46% of the collected studies ($N = 6$) were conducted within the past two years suggesting that a potential for a more comprehensive meta-analytic study exists.

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* Note, the astrix indicates a study used in the meta-analysis.

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Enhancing Community Service Learning Via Practical Learning Communities

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Abstract

The advantages of learning communities focused on analyzing social issues and educational repercussions in the field are presented in this study. The research examines the contribution of a learning community to enhancing student teachers' responsibility and their social involvement. The assumption was that participating in learning community would further implement student teachers' community social involvement while enhancing responsibility in their field of action. A questionnaire aimed to present the student teachers' attitudes involving all aspects of studying in the learning community and their social activity in the community was conducted. The findings pinpointed that there were positive contributions of the learning communities from a personal aspect such as developing self-learning, and learning about “me”, as well as broaden their teaching skills, through methodology for teacher training, and developing reflective thought. These insights can also be implemented in various educational frameworks and during service learning as part of teacher training.

Keywords: Learning communities; service learning model; practice–reflection circle; tolerance for ambiguity.

Introduction

One of the central challenges of education is to instill educators with a sense of social responsibility to their communities. Training student teachers in combination with in-depth exposure to social and educational issues by way of relevant academic learning and exposure to working in the field, accompanied by discussions of the ethical values of the relevant issues, is to us the desired way. Within this framework we need to foster an equal and non-hierarchical exchange among the learners where there is a common responsibility based on self-learning, an individual choice of content, common discussions with an ethical stand being taken and agreed upon results by all. A learning community is a framework permitting a division of responsibility between students and the lecturer.

This article deals with student teachers who are participating in a learning community, who concentrate on analyzing social issues and their educational and social repercussions in the field. The research is focusing on the learning community's extent of contribution on a personal level for the students from both a learning and teaching aspect as well as social involvement activities.

Our assumption is that through participation in a learning community, as well as practice teaching, these student teachers would implement community social involvement furthermore and improve their responsibility in their field of action.

Although the research is a time limited project and is focused on college student-teachers its insights, including personal and professional aspects of learning communities and improving students' social community activities, could be implemented in school learning processes as well.

In this manner the article summarizes the active student involvement in the community and their role in education; the learning community's extent of contribution on improving students' social involvement activities; and student teachers' attitudes to the effect of the learning and activities within the framework of the learning community.

Theoretical background

Learning community

Learning communities which began to gain popularity during the 90s is a heterogeneous framework bringing together learners around an explicit focus, emphasizing research whose purpose is to deal with a chosen problem and possible solutions (Brown and Campione, 1990; Rogoff, Matusov & White, 1996). Learning community is based on a number of qualitative principles of learning: active and effective learning, choosing the appropriate learning strategy, and is aimed toward a directed and defined purpose. The participants are encouraged to share responsibility for learning and its results, to meet particular needs by expressing personal opinions, to ask for help or specific information and to share stories of events with particular issue included emotional experiences (Brown and Campione, 1990; Mitchell & Sackney, 2009).

The aspects relating to learning community are summarized by Eraut (2002): the geographical and environmental aspects deal with inclusion and exclusion; the ecological aspect focuses on relationships between community partners; the political aspect describes a group of interests that should be satisfied; and the ideal aspect relates to participation and democratic human relationships including emotional component. Such a community considers learning a central part of interaction between people focusing on professional development. Professional development is based on constructing knowledge by sharing knowledge through meaningful dialogue while turning tacit knowledge visible. In a similar way, Bereiter and Scardamalia (1993), relate to a

learning model, Knowledge Building, where knowledge is built collectively by the community. According to this idea the goals of learning is a cooperative effort of both teachers and students to reach an understanding of events in the world and their evaluation. An improvement in learning occurs when the research on the pheromone is directed by learners' questions where the emphasis is on the required process to analyze the problem and present the solution.

The social activities within the learning community during the process of learning were highlighted by Rogoff (1996) and his colleagues who suggested that learning is a process that they defined as the "transformation of participation", in which all members of the learning community are required to be active partners in planning and designing the schedule of the changing learning process while changing their participation during various stages of learning, in line with their needs and wishes.

Thus, Harpaz (2009) emphasized the advantages and additional value of learning communities as a framework for preferred learning between the two dichotomous possibilities, positioning the centrality of the teacher or alternatively the centrality of the learner. In the learning community the traditional position of the teacher as the source of information changes, as each participant (learners and teacher), can choose his place at each stage of the learning process.

In addition, characteristic clusters which are necessary for learners, who desire to implement the vision of teaching and learning in a learning community, were defined by Shulman and Shulman (2004): a cognitive cluster that includes diagnostic ability, understanding and analysis; a behavioral cluster that includes prediction, belief in the way and mutual respect; a motivational cluster that includes seriousness, the ability to change and perseverance; an operational cluster that includes adaptive use of the curriculum; a reflective cluster that includes evaluation, reevaluation and self-criticism. Finally, Shulman emphasizes the community cluster that includes planning, thought, cooperation, mutuality, support and common knowledge. These clusters emphasize the complexity of the development of the desired and appropriate teachers for education.

But as Price (2005) argued, learning communities can offer more: curricular coherence; integrative, high-quality learning; collaborative knowledge-construction; and skills and knowledge relevant to living in a complex, diverse world. Since studies show the powerful effect of a learning community on student learning and achievement, this unique framework can also contribute to learning and participation in ethical and social issues from an academic point of view, as well as from a practical need to solve problems. Such interaction may lead to the development of social involvement that Service Learning model suggests.

Development of social interaction according to the model of Service Learning

As was stated, the development of responsibility and social interaction of students as part of their teacher training is an important pillar for basing their identity as influential leaders in their society. The part students' exposure to ethical-social issues including activities at community centers, will help the students develop the ability to serve as well as to teach and will enhance their community social activism as is suggested by the Service Learning (SL) model (Eyler & Giles 1999; Fiske, 2001; Webster & Rajotte, 2006). According to this model, learning occurs in a practice –reflection circle. Learning includes educational activities that utilize the acquired knowledge of the students, planning and adaptation of activities to the needs of the community and reflection on their experience. In this way the students gain a deep understanding and abilities and combine their cognitive academic development with their personal social development. Studies have shown that SL activities based on the combination between support in a theoretical

academic course to practice and reflection strengthen student teachers (Davis & Moely, 2006). Moreover, Bartlett (2013) emphasizes that reflection is the element that connects service and learning by planning and implementing reflection activities such as: continuous reflection, connected reflection, challenging reflection and contextualized reflection.

In research carried out by Sullivan (1991), it was found that students who were involved in community social activities during their teacher training were on a higher operational level than their peers. They showed better performance in many areas such as using variant teaching styles, the quality of interaction with their students, the level of confidence and ability that they showed in lesson planning, the quality of their communication with parents and effective use of the required abilities to carry effective discussions with adolescents. Their pedagogic performance and professional abilities won them commendable approval more than students who did not receive this training. In general, it seems that students who practice SL activities show a higher degree of commitment to their work in their discipline (Gallini & Moely, 2003).

Learning communities and the strengthening of values in the Service Learning model

The strengthening of values for training students who are active in service learning within the framework of learning communities may come through in three inter-connected ways.

1. Subject matter – intensive discussion of social issues, consolidation of moral, ethical and educational attitudes by way of exposure and understanding of various attitudes (Price, 2005).
2. Methodology and activities – a non-hierarchical discussion in the discourse community enables attentiveness and substantiation that supports the learning (Lipman, 1991; Shor & Freire 1990). It provides for a sensitive and positive climate that allows learning from mistakes (Brandet, 2000), students learn to receive and give continuous feedback (Brooks & Brooks, 1997; Perkins, 1998).
3. Integrating practice with learning – learning communities integrate theoretical discussions on social and ethical issues and reflection activities (Bartlett, 2013) alongside of practical initiatives for their solution.

This article is focused on the learning community's contribution to developing responsibility and social involvement in teacher training students.

Research questions

1. What is the students' satisfaction level from the framework of a learning community and from the accompanying contents of the course?
2. What is the learning community's extent of contribution on a personal level for the students from both a learning and teaching aspect?
3. What is the learning community's extent of contribution on improving students' social involvement activities?

Methodology

Research context

The learning community

We have defined the goals of learning communities based on the five clusters that are characteristic of education as defined by Shulman and Shulman (2004). In the cognitive and reflective clusters we assessed the contribution of learning communities from a personal aspect,

learning aspect and educational aspect. In the operational, behavioral, and motivational clusters, we assessed the contribution of learning communities in developing activities and the social involvement of the student teachers in their community.

Five learning communities, each with a leading supervisor and 12 second year student teachers, were included in this research whose subject matters were:

The Rebels in Israeli society - focused on developing students' social awareness and acknowledgement to those who are denied a voice around us. The following questions were raised: Who in Israeli society is ostracized? What does this ostracism say about us as a society and as individuals? What voices are not heard and why? During the course, a series of meetings were held with students and representatives of these communities to conduct an up close investigation by means of meetings, discussions, recordings and developing personal contacts.

Being elite - The educational elite is supposed to formulate the ethical direction of the educational system and to be involved in implementing the ways to achieve these goals, the questions that were raised: Why do we need this elite group? What do they take upon themselves and who would want to be part of this educational elite? What are the operative steps needed to establish an educational elite?

The valor of holocaust survivors and elderly soldiers - The goal was to find a worthwhile place in the public's and community's consciousness, to bridge between the past and the future of Holocaust survivors and veterans of the Second World War, and to change attitudes towards them and reveal their contribution.

Excellence and fantasy - Defining and achieving process by means of fantasy and science-fiction texts learning the standards of excellence and their relevance to the students: What is excellence? How is it possible to become attached to this abstract concept and how can science-fiction and fantasy assist us in the process?

Critical view of mass communication in the post-modern era - The era of post-modern communications, that attempts to blur the conventional contrast between the individual and the public, good or bad, especially when presenting reality, must go through the deep understanding and criticism of communication behavior. The students were obligated to integrate both theoretical understanding to analysis of actual cultural-commutative texts, and to go through three "public" stages that were presented to the learning community in order to receive feedback. In the beginning of the workshop when defining the work objective and the goals, in the middle when presenting the partial data that had been collected, researched and analyzed – and at the end when presenting the final results.

Research tool

A quantity research based on a questionnaire whose aim was presenting students' attitudes involving all aspects of studying in the learning community and their social activity in the community. The questionnaire was given at the end of the course and included three parts:

- a. On satisfaction: the extent of student agreement with the different aspects of the course was examined, based on a Likert scale 1 (very low) -5 (very high).

This section was divided into four primary satisfaction measurements:

1. The learning community model- included questions like: "Were you satisfied learning about the learning community?" or "Was dialog learning used as a format?" Reliability based on Cronbach's alpha =.88.

2. The contents of the course – included questions like: “Did the learning increase motivation for social activities” or “Were the course contents interesting”. Reliability based on Cronbach's alpha = .91.
3. The cognitive challenge of the course – included questions like: “At what level do you think was the discussion in the course?” or “Were the contents challenging?” Reliability based on Cronbach's alpha = .81.
4. The communication between the lecturer and the students – included questions like: “Was communication with the lecturer of a high level?” or “Did the lecturer encourage differences of opinion?” Reliability based on Cronbach's alpha = .88.

In addition, the students were also asked in an open and closed manner on additional aspects related to their general satisfaction, such as, would they want to study an additional course with the same format, would they change the content of the course.

b. A questionnaire on the contribution of the course to the students examined the extent in which the students felt they had benefitted from studying in a learning community. The questions were on a Likert scale from 1 (very low) to 5 (very high) and consisted of five indexes:

1. Learning about me as a person – A measurement of the extent the student felt the course had contributed to his/her personal development. Reliability based on a Cronbach's alpha = .84
 2. The development of skills and learning abilities – included questions like: “improved my capabilities” or “empowered me as a person”. A reliability check showed a Cronbach's alpha = .77.
 3. The contribution of the course to my training as a teacher - included questions like: “developing my skills as a teacher” or “improve me as a teacher”. Reliability based on Cronbach's alpha = .78
 4. Development of reflective thinking and the ability to evaluate colleagues – included questions like: “improving reflective thinking” or “developing feedback ability”. Reliability based on Cronbach's alpha = .76.
 5. Development of social awareness - included questions like: “developing social awareness” or “reinforcement community contribution”. Reliability based on Cronbach's alpha = .77
- c.** The connection between student participation in a learning community and their social involvement in the community. The students were asked if social involvement is to be carried out in the framework of a learning community, are there advantages in this connection and if they would be interested in continuing social involvement beyond the required hours of the program.

Weekly feedback of the learning community lecturers – every week each lecturer presented a reflection of the activities of the learning community. These reports were the basis for discussions, reflection and evaluation in the each course.

Population

The survey was answered by 48 students, 83% were women (N=39) and 16% men (N=8). Most of the students (97.8%) are in their twenties, where the average age was 25(SD=2.18). The students, who come from various disciplines of study, are in their second year of study at the college (N=47). The students chose one out of five different courses of the learning community and for 77.1% of them the course that they had chosen was their first preferred choice (N=37).

Findings

The data shows us that the average response of the participants to four out of the five learning communities were similar, therefore the analysis will be separate from the analysis of the fifth community, which had a deviation in its average responses.

Student satisfaction from the learning community

1. From table 1 we can see the students who express satisfaction from the various aspects of the study in a learning community (M=4.22). They are satisfied with the content of the course and that it has aroused in them a high motivation to continue social activity (M=4.42). In addition, they are of the opinion that the level of the cognitive challenge of the course was high (M=4.21), and mainly that the communication between the lecturer and the students was good (M=4.43). The average of the satisfaction of the students from the learning community course was very high (M=4.53, SD=.68).

Table 1. Means and standard deviations of student attitudes towards studying in the course (n=39)

Satisfaction	Mean	S.D
Satisfaction of Learning Community Model	4.22	.85
Satisfaction of course content	4.42	.65
Level of cognitive challenge	4.21	.56
Contact between lecturer and student	4.43	.58

2. To the question whether they would be willing to study an additional course in this framework 50% of the students answered “perhaps” and commented on the lecturer, the subject of community, a clear understanding of the goals of the course, and at which hours it would be given. 39.5% (N=15) answered that they were interested in studying an additional course in this format and commented that the format of the course was unique and meaningful. Only 10.3% (N=4) answered that they were not interested in studying an additional course in the framework of a learning community, because of its unique learning style and because of a limitation of time.
3. Most of the students 92.1% (N=35) commented that they were not interested in changing the content of the course because the course was interesting and contributed on the one hand to their self- awareness and on the other hand to a recognition of various groups in society. Seven responders qualified their answers and commented that in spite of the fact that they wouldn’t change the content there was a noticeable lack of time that resulted in the inability to delve into certain aspects and would choose to discuss fewer topics or extend the course for an additional semester. Only three students (7.9%) commented that they would change the content of the course. One suggested to cut some of the material in order to delve deeper into other subjects, another suggested to give more theoretical background in the beginning in order to be better prepared for the field work.

4. The students were asked if they would change the nature of the study and were asked to specify in an open manner their choice. 71.1% (N=30) would not change the nature of the course. Just four expanded on it :29.9% (N=11) would change the nature of the course, they suggested defining the goals more clearly, using a variety of learning styles by adding field trips and/or students raising dilemmas and giving greater possibility of choice of articles to read or changing existing reading material.
5. Most of the students felt that obligation to the course on learning communities was higher than to other courses (M=3.94, SD=.82).

A summation of the assessment of satisfaction from learning communities: the course was enlightening, enriching experiential that allowed a lot of learning about oneself, on excellence and on studying in a learning community. In addition, they praised the lecturers of the learning communities. Along with their satisfaction they commented on the problem of time – they requested an extension of the course complained on the amount of study material and requested more peer teaching.

The contribution of a learning community

The different aspects of the extent of the contribution of a learning community to the student are presented in table 2.

Table 2. Means and standard deviation of the contributions to the students in the course from a learning community (N=39)

Area of contribution	Mean	S.D
Learning self-awareness	3.57	.88
Developing learning skills	3.35	.90
Contribution of the course for teacher training	3.78	1.0
Developing reflective thinking and self- assessment	3.48	.95
Developing social awareness	3.88	.84

From the table we can see that the students felt that their contribution in several aspects was above average, and that they developed as a result of the course a relatively higher social awareness (M=3.88). The course greatly contributed to their training as a teacher (M=3.78) and an above average on learning about themselves (M=3.5). In addition, in the student's opinion only contributed on an average level to developing reflective thinking and the ability to give feedback to another (M=3.48) and developing their learning skills and abilities (M= 3.35). The relation between students' satisfaction from the learning community model and the variables based on Pearson correlation is presented in table 3.

Table 3. Pearson correlation between satisfaction measures and contribution measures

	Learning Community Model	Course Content	Cognitive Challenge	Student - Teacher Relation
Learning self-awareness	.55**	.55**	.62**	.38*
Developing learning skills	.35*	.45*	.58**	-.01

Contribution of the course for teacher training	.21	.45**	.30	.05
Developing reflective thinking and self- assessment	.41**	.29	.41**	.47**
Developing social awareness	.26	.68**	.43**	.17

A positive and significant correlation was found between most of the aspects of satisfaction from the learning communities to the contribution they had for the students. That is to say, the more the students felt greater satisfaction from the learning communities the more they felt their contribution to them.

The elements that had the highest correlation between satisfaction and contribution were – satisfaction from the content of the course and the level of cognitive challenge: as long as the students felt a higher level of satisfaction from the contents of the course they felt that they experienced a cognitive challenge in the learning community, and therefore they felt they benefited more from it.

The contribution measurement with the strongest correlation to measurement of satisfaction was learning about oneself as a person. The more the student felt he was learning about himself as a person he felt greater satisfaction than any other aspect. On the other hand, the feeling that the learning community contributed to student training as a teacher was connected only to the satisfaction from the discussed contents.

Social involvement

More than half of the students (58.5%) commented that they were planning to be active in social involvement in the framework of the learning community. 20% cited alternative involvement, and others would do it in their first year of study. 73.3% of the students felt that there was an advantage to participating in a learning community in parallel to being active in social involvement (N=22), 61.5% (N=16) answered that they would like to continue their social involvement even after the required hours.

The lecturers in the communities, who had documented weekly the activities of the community, felt that their supervision in the learning communities was as significant for them as it was for the students. From these reflective documents it is evident that the interaction in the framework of the learning communities was just as challenging for the lecturers from the aspect of content and their method of supervision. The innovation of students and lecturer's sharing responsibility required appropriate preparation and dealing with unknown situations. These led to ambiguous and uncertain learning situations that challenged both the lecturers and the students in the learning community.

In comparison to these findings, in one of the other learning communities (A Critical view of mass communication in the post-modern era) there were different findings. The satisfaction of the students from the different aspects was average to less than average. The students had only an average satisfaction from the level of challenge (M=3.52), just average for the model of the community (M=3.52). A low level of satisfaction from the content of the course and the communications between the lecturers and the students (M=2.66, M=2.94 compatibility). On the average the level of satisfaction from the students of the learning community course was low (SD=1.00, M=2.66).

The students felt that their contribution from the learning community was average or less than average. As the students reported they only developed average learning skills ($M=3.14$) and reflective thinking and peer assessment ($M=3.11$). In addition, the learning community had contributed a very small extent to their learning about themselves, to their training as teachers and to their social awareness ($M=1.83$, $M=2.33$, $M=2.33$). The lecturer in this learning community encouraged ambiguous situations that gave the students feelings of uncertainty that hindered the success of the learning. In a sense this ambiguity is an essential part of this challenging learning experience of a learning community but in this community it turned into a frustrating experience.

Summary and Discussion

The contribution of a learning community

From these finding we can see that four out of the five learning communities accomplished most of their goals. The students reported on a general high level of satisfaction from the studies, enrichment, experience, and mainly from developing self-learning. In their opinion, the framework of a learning community, which was based on good communications between their peers and lecturer, supported them in learning the content; it placed before them cognitive challenges, and contributed to their motivation for social action.

The contribution of learning communities to the students had many aspects: from the social-community aspect, they developed a high social awareness, and participated in community activities; from the teaching aspect it greatly contributed to their training as teachers; from a personal aspect it contributed to learning about themselves, developing reflective thinking and the ability to give feedback to others; from the cognitive-learning aspect they developed skills and learning abilities. The lecturers reported as well on the challenging and unique experiences that contributed to them as teachers.

The response of the participants suggests the positive contribution of the learning communities to achieve the central goal of developing social involvement in the community, at least during their time studying. Beyond the social contribution the students reported on the contribution of the learning communities from a personal and educational aspect, and pointed out the contribution of the methodology that is the basis for learning communities for additional aspects: for teacher training, developing self-learning, learning about “me” and developing reflective thought. All these are essential elements of teaching in a larger sense, and are connected to the learning clusters that Shulman defined when he referred to the contribution of a learning community to teaching and learning- the cognitive and reflective cluster, as well as the motivational, behavioral, and operational clusters (Shulman & Shulman, 2004).

The learning process that occurred in a learning community is a way to acquire a desirable learning model as described by Harpaz (2009) in relation to a third model of education. According to this model the lecturer has an important role as a senior partner in the learning process that allows “a constructive meeting between the society and the culture”, to find solutions to problems or subjects that invite thought and investigation. Therefore the process of learning in a learning community allows each individual to build on his/her knowledge and develop different aspects as described by students in the research.

From a personal and professional future development aspect:

“As a result of the course I felt a strengthening of my self-confidence and abilities. The learning community helped me develop as a person and contributed to my training as a teacher in the future, it improved my learning skills and ability for self- learning”.

From an interest and enrichment aspect:

“The course was experiential, with very interesting content, varied, engrossing and enriching! It really made me open my eyes and raised my consciousness to the topic. I now see that the studies are much more meaningful and deep for me”.

“This has been the most meaningful course for me and is the only thing that I have gained from the program”.

From the aspect of the level and quality of the course:

“Presentation of the material by the students bringing up current dilemmas, stories that encouraged group discussions – that raised deeper questions for later ideas. Beyond the fact that this course must be a year course, was amazing, enriching and intellectually stimulating. The lecturers were fantastic, real and open to all views”.

From the aspect of the learning community:

“We are talking about a course that I waited for the whole week, especially since the content had fewer studies but more discussions and social activity, we felt we were a select group in a community with an outstanding mentor! The lecturer was open to all views from the students and I felt the lecturer learned from the students as well”.

Challenges exposed by a learning community

In this research we saw that one of the five communities that was checked, reported a lower level of satisfaction than the other communities. The main reason for this lower level of satisfaction, as expressed by the participants, was the ambiguity that accompanied the learning community's progression. What stood out with this community was the demand of participants' responsibility sharing not only in the learning process as in the other communities, but also to determine the learning framework. This ambiguous situation, that exceeded the limits of patience of the learners, was very demanding on the students and expressed by their lower level of satisfaction from the course.

The findings of this group exposed one of the critical challenges that learning community participants have to face. As stated, at the basis of a learning community there exist some vague situations that arise from the need to hold a dialogue among equals where all the participants are responsible for determining the daily schedule, its content, activities and the final results of the studying. These situations are a challenge to the lecturer as well as the students: the lecturer is tested on his ability to navigate the participants into cooperative action, that allows them choice and demands responsibility, and the students are tested on their ability to share responsibility and to develop tolerance for ambiguity. In four out of five communities the level of ambiguity led to satisfaction, while in the fifth community the challenge overcame the ability to deal with it.

The importance of ambiguity to the structuring of knowledge is certain, acceptance of meaning and interpretation ‘that is already formulated’ without giving the learners an opportunity to deal with the problem, harms the process (Wiggins & McTighe, 1998, pp.50). Therefore, when presenting problems before a learning community without presenting solutions, where the teacher leaves unsolved ambiguous situations to evolve, he allows the students to build their knowledge independently.

Another important role of ambiguous situations, that change to be important and relevant in learning communities, is allowing the participants to re-organize their group. When the group

organizes in ambiguous situations there is a possibility to organize on a basis of equality and not hierarchal. An organization based on equality offers the possibility of students to lead the subject being learned and to find the appropriate knowledge (Ronen, 2013). For these reasons the students in the group were given a central role but this was not fully exploited.

It was to be expected that the students would prefer equals-situation which would enable them to choose the subject matter, determine the framework of studying and assume the responsibility for learning. It was to be expected that a different attitude to the role of the lecturer would awaken an interest and enthusiasm and challenge the participants for leadership. In reality, it turned out that sharing responsibility and the level of ambiguity in this new situation changed one of the groups from being challenged to being frustrated; instead of being a factor to activate the students, it hindered the students and sometimes even the lecturer. Additional research is necessary to study cultivating limits of ambiguity in learning in the framework of learning communities and the conditions that allow students to succeed in dealing with group problems and activities while structuring their knowledge, as we saw in the other communities.

Researchers have stated that there are additional challenges the learning communities raise and that is the difficulty in implementing learning communities practically and structuring the outcome and its assessment. Bereiter & Scardamalia (1993) explain the difficulty as a result of the responsibility for learning rests on the individual learner, while the implementation and assessment of the outcome are by the group. While Armstrong (2012) pointed that people put in groups lose their sense of individual responsibility. According to them, this complex situation is a deterrent in the success of implementing learning communities.

Rogoff (1990), clarifies the topic from a social cultural point of view, emphasizing the participants' activities in the common work. There is mutual influence of the individual on the culture, while being developed by means of this mutual influence cultural tool. The individual conceives that his actions in the social cultural framework is bound up and integrated with the participation of his peers for the continuous and long term achievement activities. But this can cause difficulty that expresses itself in lack of success in group objectives in the short term.

Opposing these studies, this current study shows that students, who successfully deal with the challenge of ambiguity and sharing responsibility, were satisfied with the implementation of the process connected to the learning communities. They enjoyed cooperating in the group and reached group results through communal action in the community.

Conclusions

Several possible reasons may explain the successful encounters of the students as presented in this research:

The learning contents - the topics discussed in the learning communities enabled a variety of ideas and thoughts, the positions and attitudes of each participant in an atmosphere of respectful discussion allowed for various solutions and appreciation of the process and not only the outcome. There was less pressure that often characterizes other curriculums where one correct solution is demanded, and upon which the student is judged.

The outcome and range of achievement – the type of assignments derived from the learning process of the learning communities dealt with a wide range of social activities that led to significant outcomes. This type of work requires focused and efficient cooperation of the participants and requires an extended period of time to accomplish it. All this was supported by a cooperative atmosphere around the learning outcome of the group. It seems that the learning community is in fact an appropriate setting for learning and working that arises from the joint

responsibility that are connected to these complex issues, that requires discussions and brainstorming, that leads towards working on a mutual outcome over an extended period of time.

Personal and group assessment – in the framework of the learning community at every meeting each student received a peer's and a lecturer's constructive assessment. In addition there was a constructive group assessment and a final assessment that related to the activities, the process and the outcome. Each student knew what their place was in the group and tried to improve his/her way of working on their learning outcomes until the final results. In this way the constructive assessment was used as a personal learning tool, and as a means of generally uniting the group. It was non-threatening and the participants contributed in improving the final outcome.

A possible implication of this study is implementing the learning process that occurred in a learning community, as a way to acquire a desirable learning model in schools from a personal and professional future development aspect as well as from an interest and enrichment aspect.

The limitation of the research lies in its short time period, since the basis for achievement is common for all the members of the learning community (the emphasis is not on the individuals' characteristics), these mutual processes are continuous and long term which can cause difficulty that expresses itself in lack of success in group objectives, that we are witness to in the short term.

Additional research is necessary to study cultivating limits of ambiguity in the framework of learning communities; the conditions that allow students to succeed in dealing with group problems and activities while structuring their knowledge; and the ability of the students to implement the process that they experienced as participants in a learning community, trying to be lecturers of learning communities in their schools.

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Preschool Predictors of Kindergarten Language Outcomes

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Abstract

The aim of the present study is to explore a variety of cognitive and social variables which are most relevant to children's linguistic success in an educational setting. The study examines kindergarten English language outcomes in classrooms containing monolingual English speaking children and bilingual children who speak English and one other language. Data from the National Center for Early Development and Learning Multistate Study of Pre-Kindergarten (2001-2003) regarding classroom and student characteristics were used for bilingual (N = 120) and monolingual (N = 534) children. Hierarchical regression analysis (Study 1) and path analysis (Study 2) were conducted to determine the cognitive and social variables present in preschool that are most predictive of English skills in kindergarten. The results of the studies demonstrate that social variables were important for both monolingual and bilingual children. Personality variables were more predictive for monolingual children, whereas teacher relationship variables were more important for bilingual children. Simple and routine adult interaction was predictive of English skills in both groups, which may indicate the importance of implicit learning over explicit instruction in early language acquisition. The present studies found different predictors of English language skills for monolingual and bilingual kindergarteners.

Keywords: bilingualism; language; quantitative; kindergarten; English; education.

Introduction

A long-standing question in the field of second language acquisition is the effect of early exposure to multiple languages. This question is gaining significance in educational practice as the world becomes increasingly globalized and children are increasingly exposed to multi-language situations (Buac, et al., 2014; Kaushanskaya, M., et al., 2014). The effect of early exposure is especially relevant when considering the best linguistic environment for children's academic success. The field has undergone dramatic changes in recent decades regarding assumptions about what makes a linguistic environment ideal for academic and educational success (Cirino, et al., 2007; Pena, 2012; Uccelli and Paez, 2007). Historically, it was assumed that exposure to multiple languages in early childhood hindered academic success by creating confusion (Byers-Heinlein, 2013; Bialystok, 2006; Hambly, et al., 2013; Pena, 2012). In the last several decades, research has indicated that multi-lingual children show higher levels of performance in many areas. For example, Kovaks and Mehler (2009) demonstrated that infants who have been exposed to multiple languages show increased cognitive control prior to speech development (Brito and Barr, 2012; Cattani, et al., 2014; Dixon, et al., 2012). Executive functioning ability has been shown to increase in bilingual children and adults (Bialystok, 2011; Bialystok, Craig, & Luk, 2008; Bialystok, et al. 2014), especially in the domains of executive function that require individuals to successfully divide attention between conflicting stimuli (Carlson & Metlzooff, 2008). Evidence has recently suggested that bilingualism may even serve as a protective factor against declines in older age (Bialystok, 2011; Luk et al., 2011; Bialystok, et al., 2014; Fernandes, et al., 2007; Siyambalapitiya, et al., 2009).

While there is clear evidence supporting benefits to multi-lingual exposure across the lifespan (Brito and Barr, 2012; Bialystok, et al. 2014; Fernandes, et al., 2007), there are also challenges that bilingual language learners face (Bialystok, 2006; Byers-Heinlein, 2013; Carlson and Meltzoff, 2008). Perhaps the most daunting of these involves the best practices for educating children who are exposed to multiple language environments, especially when a child is being educated in his or her non-dominant language (Bialystok, 2006; Byers-Heinlein, 2013). Carlson and Meltzoff (2008) show that while bilingual kindergarteners show superior performance in executive functioning compared to their monolingual peers, children who had been recently immersed in a second-language kindergarten program did not show this superiority effect (Cirino, et al., 2007). This suggests that the benefits to bilingualism only arise once a child shows some degree of mastery over both languages. For children experiencing their second language only after entering a formal educational setting, this phenomenon may substantially decrease the child's ability to succeed in school-based achievement.

Other authors have pointed out the importance of continuing linguistic development in both languages, to the extent that meta-linguistic understanding of the first language serves to bootstrap further learning of the second (Collier, 1989; Hambly, et al., 2013; Lunden and Silven, 2011; Pena, 2012). It is thought that the process of limiting linguistic mastery in the first language also dampens the individual's ability to demonstrate proficiency in the second, a process known as limited or subtractive bilingualism (Bialystok, 2006; Byers-Heinlein, 2013; Cummins, 1979, 1981; Hall, Cheng, & Carlson, 2006; Lambert, 1984). This is related to extra-linguistic factors such as the value placed by the individual on the culture associated with each language and self-esteem (Chen, 2013; Landry & Allard, 1993; Landry, Allard, & Deveau, 2009). Phenomena such as limited bilingualism may be especially relevant for children entering a formal education setting in terms of the social relationships that are concurrently being formed with peers and teachers.

Little research has attempted to ascertain exactly which elements of language experience are most relevant to school success. To narrow down potential variables, one can borrow from the

literature on first language acquisition. The current psycholinguistic literature endorses several variables as viable contributors to language development in typical early childhood (Brito and Barr, 2012; Byers-Heinlein, 2013; Kirkham, Slemmer, & Johnson, 2002; Slemmer, & Johnson, 2002). Several of these variables are related to low-level perceptual-motor skills and are typically associated with language development in early infancy (Brito and Barr, 2012; Byers-Heinlein, 2013; Garcia, et. al, 2007). For example, it is known that very young infants can learn novel word boundaries based on co-occurrence statistics after only minutes of auditory input (e.g. Gomez & Gerken, 2000; Kirkham, Slemmer, & Johnson, 2002; Sabbagh & Gelman, 2000; Saffran, Aslin, & Newport, 1996; Saffran et al., 1997).

Motor Skills

Conway et al. (2011) assessed children's fine motor skills using the sequential finger-tapping task of the Developmental Neuropsychological Assessment (NEPSY) (Korkman, Kirk, & Fellman, 1998). This task requires children to tap each finger against his/her thumb in sequential order. Children are timed until they correctly repeat the task a given number of times. Conway et al. assessed deaf children with cochlear implants, who often show language delays even after partial hearing is restored through cochlear implantation. The authors found that children's language skills were significantly correlated with their scores on the finger-tapping task.

Other studies have examined this relationship in children with other language deficiencies (Bird, et al., 2008; Highman, 2013; Peeters, et al., 2009), such as dyslexia. Viholainen and colleagues (2002) performed a cluster analysis on children at risk for developing familial dyslexia and children not at risk. They used a battery of tasks designed to measure early motor skills. They found that with children who were not at risk for dyslexia, three clusters emerged associated with fine motor development, and both fast and slow gross motor development. However, for the children at risk for dyslexia, only two clusters emerged, associated with fine motor development and gross motor development. Other work has demonstrated that children with L1 impairment showed delays on significant motor milestones, such as walking, along with significant abnormalities on MRI scans compared to typical language developing children (Aro, et al, 2009, Choudhury et al., 2007; Trauner et al., 2000).

Social Environment

Another broad area of research pertaining to children's success with language development concerns their social environment (Bridges and Hoff, 2014; Chen, 2013; Cattani et al., 2014). Language is clearly an interactive process. In fact, there are aspects of language acquisition that have been shown to be "unlearnable" through linguistic input alone. Kuhl, Tsao, and Liu (2003), have shown that for the acquisition of phonology, exposure to linguistic information may not be enough. In this study, live interaction of an infant with an adult was necessary for children to acquire phonology of an unfamiliar natural language. Perhaps the most telling result was that infants still showed the effects of the live exposure up to 1 month after the sessions had been extinguished. Furthermore, the experiment was replicated with televised or audio exposure to the second language (Kuhl, 2007; O'Doherty, 2009). The infants were able to learn more successfully through the video condition, which contained many similarities to the live interaction in the initial study such as the infants' ability to see the speakers' faces.

Another line of research examines "motherese," or the prosodic cues that are salient in infant directed speech that are believed to be partially responsible for the importance of social interaction for infant language learning (Kuhl, 2014; Mampe, 2009; Rivero, 2010). It is postulated that this specific type of adult-infant interaction plays an important role in infants'

ability to bootstrap auditory speech input to language rules. Motherese is characterized by the use of higher pitches, exaggerated intonation and stress, repetition of content words, and the use of simple sentences (Fernald & Mazzie, 1991). Merzenich and colleagues (1996) and Tallal and colleagues (1996) have both shown that altering auditory features of speech input can significantly help language delayed children improve their speech skills. Though these studies did not use motherese, the features that were altered in the speech streams were chosen to coincide with common exaggerations seen in motherese (e.g., lengthening phonemes). Likewise, when adults who were trying to learn a second language were exposed to inputs that mimicked motherese, their learning was facilitated (McClelland et al., 1999). Even computer models, though unable to master phonology completely, improved when inputs were altered to reflect motherese (Kitamura, et al. 2014; Rabiner & Juang, 1993). Evidence suggests that children naturally show social imitation in broad contexts, which may be implicated in language acquisition (Roseberry, 2014; Tare, 2011). For example, Kuhl and Meltzoff (1996) showed that infants at 12, 16, and 20 weeks old were more likely to babble using vowel sounds they had recently heard, indicating linguistic imitation at only a few months of age.

These social variables are demonstrated in early infancy, though there is reason to think that important social variables also extend to language development in school-aged children and adults. In these areas of the literature, the language learning situation is often described in terms of individual or social factors (Bridges and Hoff, 2014; Chen, 2013; Palermo and Mikulski, 2014; Pierce, 1995). For example, Pierce (1995) describes how a second language learning adult may be described individually in terms of his or her motivation, anxiety state, self-confidence, or introversion/extroversion. On the other hand, his or her social context may be described in terms of the relationship between the second language learning group and the dominant language group (Cattani et al., 2014; Dixon et al., 2012; Buac, et al., 2014). In a classroom setting, this may be the relationship between the second language learner and his/her monolingual peers or teachers.

Present Study

Taken together, the literature on first language acquisition suggests that there may be at least two important contributors to language development. Cognitively, it is necessary that children possess the low-level cognitive capacity to parse auditory input to make sense of the sounds in their environment. These low-level cognitive variables may be measured in terms of motor skills at both the fine and gross level. Socially, it is necessary that children be exposed to the type of social environment appropriate for social imitation and language learning, and must be examined at both the individual and social level. However, these predictors of language development have never been studied together and have never been looked at in children experiencing different language learning conditions. The aim of the present study is to systematically examine the effects of motor skills and social environment on language learning.

Method

Participants

The data analyzed in this study were taken from the National Center for Early Development and Learning Multistate Study of Pre-Kindergarten, 2001-2003, a part of the Child Care and Early Education Research Connections project (Clifford et al., 2009). This early development initiative collected data from schools in Illinois, Kentucky, Ohio, Georgia, the L.A. and Central Valley regions of California, and the New York City and Albany regions of New York. Preschools receiving state funding were randomly selected to recruit volunteer participants. For the present study, data were used for child participants whose parents reported that they spoke both English

and another language in kindergarten (bilingual group, N = 120) or only English (monolingual group, N = 534). Ages of the participants were not reported in the original data.

Measures and Procedure

The children were administered a battery of tests throughout their enrollment in preschool and in kindergarten. In the present study, data were used from the Classroom Assessment Scoring System (Pianta, La Paro, & Hamre, 2004), which is a classroom observation measure used to assess a child's experience within a classroom. In this analysis, data were used only from the observations that occurred in the child's preschool classroom during the fall semester. The variables from this measure include characteristics of the child's engagement in different types of simple cognitive activities as well as their engagement with their teacher and other adults in the classroom. The occurrences of behaviors are scored for the number of times they occur over a 20-second period. Each child in this sample was observed for an average of 51.1 20-second intervals. Teacher ratings of children's social skills were also used via a questionnaire designed by Hightower (1986). Only factors relating to the children's social skills were used for the present analyses. The data for this assessment was collected during the fall of the child's preschool year. The last measure used was the Oral and Written Language Scale (OWLS) (Carrow-Woolfolk, 1995) which was administered during the spring of the child's kindergarten year. This measure is used to assess a child's ability to use and understand spoken English.

Analyses

Two hierarchical regression analyses and two path analyses were conducted, one each on the bilingual children and one each on the monolingual children. The dependent and independent variables tested were identical for the two regression analyses and the two path analyses. All analyses were conducted using the software SPSS 18th Edition (SPSS Inc, Chicago, IL).

In the hierarchical regression analyses, four models were tested predicting the children's OWLS scores in Kindergarten. All of the independent variables included in the models were assessed during the fall of the child's preschool year. The first model included demographic variables: the child's gender, the child's family income, and the child's mother's level of education. The second model additionally included basic cognitive factors observed during the Snapshot classroom assessment: the time the child spent engaged in fine motor skills, gross motor skills, and letter/sound activities. The third model included variables related to the child/teacher relationship: the amount of simple or routine engagement the child had with an adult in the classroom, the time the teacher spent engaged with the child didactically, the time the teacher spent engaged with the child in a second language, and the amount of encouraging and scaffolding the teacher provided the child. The fourth model included specific personality characteristics of the child that may affect how much he/she engages socially with other people. These variables included the preschool teachers' ratings of the child's competence, assertiveness, and peer social skills using the Hightower questionnaire.

As mentioned, the two path analyses were conducted the hierarchical regression analyses. The aim of the path analyses was to further explore the relationship between the social variables present in Models 3 and 4 of the hierarchical regression analyses. It was hypothesized that both mother's education and family income would influence how children would be rated by their teachers in competence, assertiveness, and peer social skills. These factors, along with adult routine/simple interaction, teacher encouragement/scaffolding, teacher didactic engagement, and teacher engagement in a second language would predict OWLS scores in kindergarten. Additionally, it was predicted that mother's education would have a direct effect on OWLS

scores. As in the hierarchical analyses, two separate path analyses were conducted for monolingual and bilingual children.

Results

The results of the hierarchical regression analyses can be seen in (Table 1). For the monolingual children, each of the four models tested was a good fit, as shown by an analysis of variance (all p 's < .001). Models two and three, containing perceptual motor and teacher relationship variables, did not significantly contribute to the variance explained ($\Delta F = 0.16$, $p > .10$ and $\Delta F = 2.20$, $p > .05$, respectively). Model 4, however, which added in personality characteristics important for the child's engagement in social interaction, explained significantly more variance than the demographic characteristics, cognitive factors, and teacher relationship factors alone ($\Delta F = 13.45$, $p \leq .001$; R^2 change = .06) and accounted for 21.5% of the overall variance. The variables in model 4 that significantly contributed to the explained variance were family income, mother's education, simple and routine adult interaction, the preschool teacher's ratings of the child's competence, and the child's level of assertiveness.

Table 1. Hierarchical Regression Analysis Predicting Language Scores of Monolingual Children

	Monolingual Children			
	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>	<u>Model 4</u>
Child's Gender	-1.44	-1.43	-1.52	-0.62
Mother Educ	2.43***	2.42***	2.34***	1.92***
Family Income	0.54***	0.54***	0.53***	0.50***
Fine Motor		-2.21	-2.82	-2.65
Gross Motor		-4.93	-3.48	-8.07
Letter/Sound		1.17	1.72	-1.95
Adult Routine Interaction			12.18*	12.58*
Teacher Scaffolding			5.00	2.76
Teacher Didactic			-9.01	-9.19
Teacher 2 nd Lang			-25.12	-25.63
Child Competence				3.55*
Child Assertiveness				1.91*
Child Social Skills				-1.59
F Change	28.43***	0.16	2.20	13.45***
R ² Change	.139	.001	.014	.061

Table 2 shows the results for the bilingual children. Each of the models tested had moderately good fit (all p 's < .05). Like the previous analysis, Model 2 did not significantly contribute to the explained variance in OWLS scores ($\Delta F = 1.09$, $p > .10$). However, Models 3 and 4 were significant ($\Delta F = 2.59$, $p \leq .05$; R^2 change = .09; $\Delta F = 3.37$, $p \leq .05$; R^2 change = .08). The final model accounted for 30.8% of the overall variance in OWLS scores. In the final model, the amount of simple and routine adult interaction positively predicted OWLS scores, while the level of teacher engagement and scaffolding negatively predicted OWLS scores.

Table 2. Hierarchical Regression Analysis Predicting Language Score of Bilingual Children

	Bilingual Children			
	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>	<u>Model 4</u>
Child's Gender	-2.50	-2.33	-3.13	-2.47
Mother Educ	1.85	1.94	1.84	1.27
Family Income	0.75*	0.83*	0.79*	0.62
Fine Motor		-20.49	-15.73	-4.86
Gross Motor		-30.03	-37.32	-44.56
Letter/Sound		6.27	-0.46	5.85
Adult Routine Interaction			35.17*	40.08*
Teacher Scaffolding			-27.47*	-30.54**
Teacher Didactic			6.80	14.52
Teacher 2 nd Lang			-19.96	-24.64
Child Competence				4.55
Child Assertiveness				0.07
Child Social Skills				0.91
F Change	3.83**	1.09	2.59*	3.37*
R ² Change	.107	.030	.090	.081

* Indicates significance at the .05 level.

** Indicates significance at the .01 level.

***Indicates significance at the .001 level.

Interestingly, both sets of results implicate the importance of social interaction during language development in the preschool and kindergarten years. Whereas for monolingual children language appears to be more closely tied to individual personality traits indicating sociality, the success of the bilingual children was tied more closely to the relationship they experienced with adults in the classroom. Interestingly, the language skills of neither group of children were predicted by lower-level perceptual motor engagement.

The results of the two path model analyses can be seen in Figure 1 and Figure 2. As indicated by the hierarchical regression analyses, different patterns of results were seen for monolingual and bilingual children. For the monolingual children, family income and mother's education predicted competence, which in turn predicted OWLS scores; mother's education was directly related to

OWLS scores; and their simple and routine interactions with adults in the classroom predicted OWLS scores (p 's $\geq .05$). Overall, 17.5% of the variance in OWLS scores was explained. For the bilingual children, the demographic variables were not predictive of social personality characteristics (all p 's $> .05$). Likewise, the personality characteristics were not significantly predictive of OWLS scores (all p 's $> .05$). However, mother's education, simple and routine interactions with adults in the classroom, teacher encouragement and scaffolding, and teacher engagement in a second language were all predictive factors in OWLS scores in kindergarten (all p 's $\leq .05$).

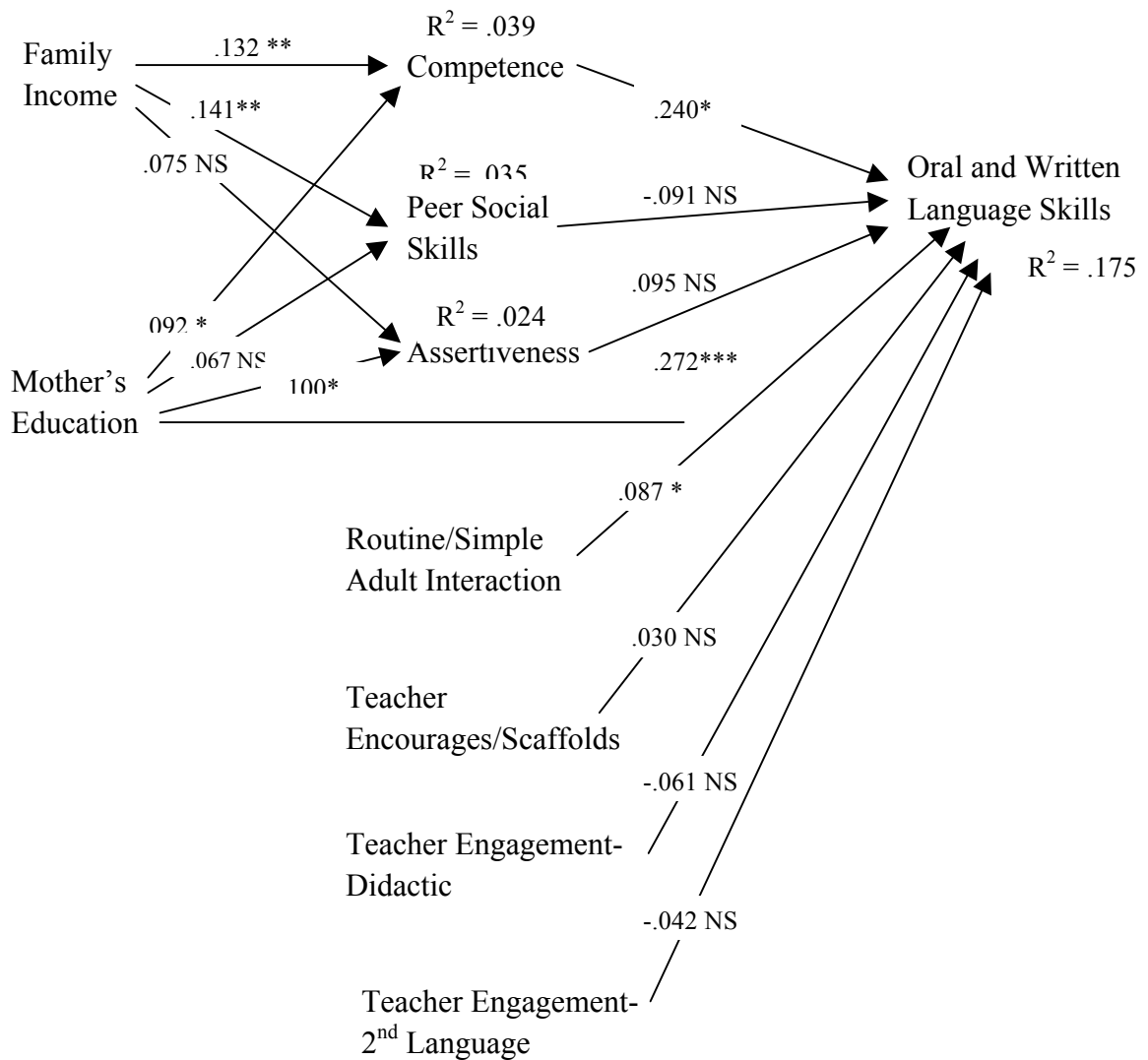


Figure 1. Path Analysis Predicting Language Scores of Monolingual Children

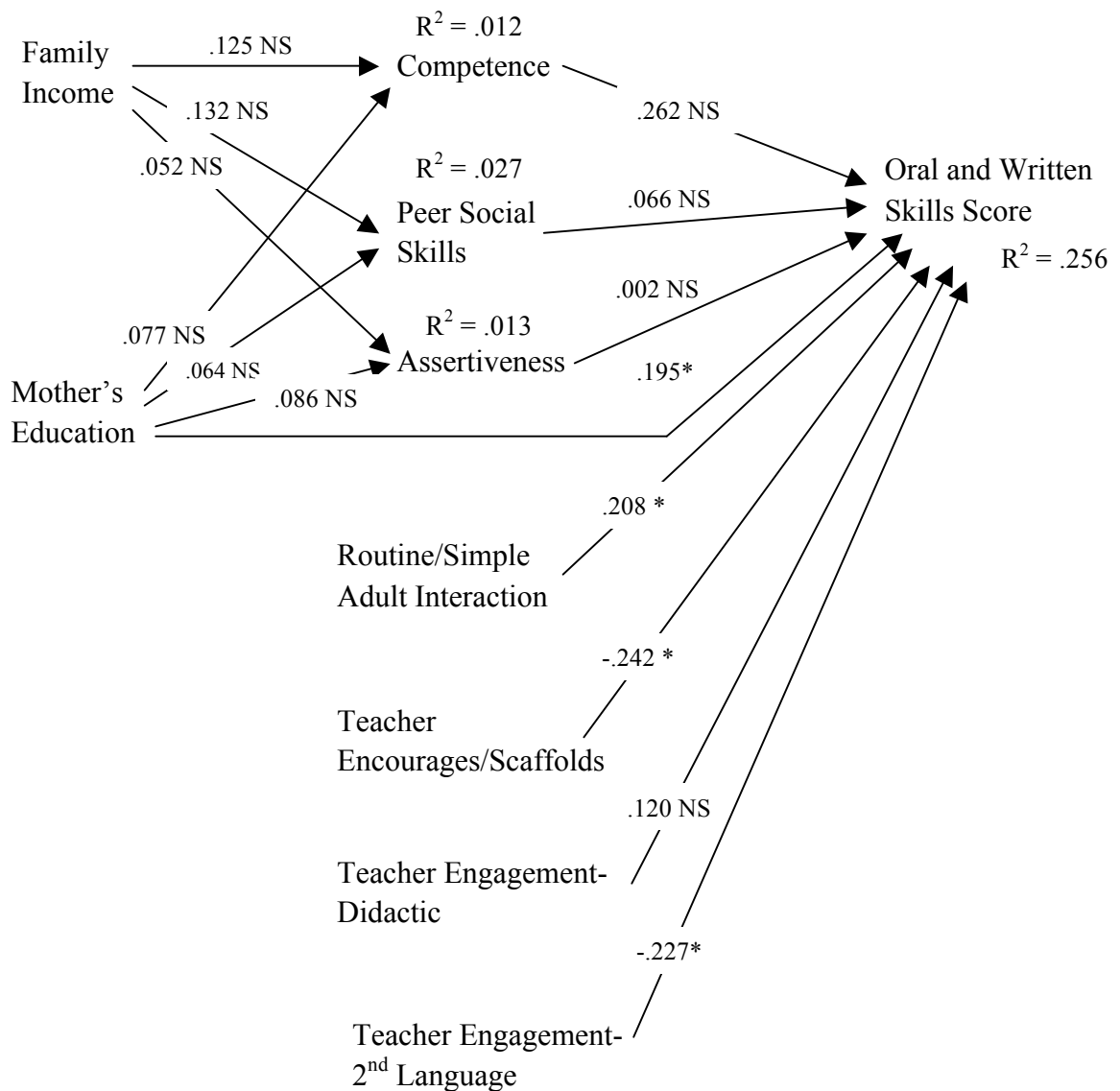


Figure 2. Path Analysis Predicting Language Scores of Bilingual Children

Discussion

These findings have several implications for language learning in monolingual and bilingual children. First of all, in both groups of children, the child's engagement in fine and gross motor activities, as well as sound/letter activities were not predictive of kindergarten language outcomes in the hierarchical regression analyses. This finding indicates that, according to this set of analyses, the time spent engaged in important, but cognitively "low-level" activities did not affect language outcomes for the children. This is surprising, considering that previous research has suggested that children with language impairments may also have impairments in motor tasks (Conway, Pisoni, & Kronenberger, 2009; Marton, 2009; Viholainen et al., 2002). However, the lack of a statistically significant outcome is likely due to a lack of sensitivity in the measure of motor skills used in the current study. The predictions made in Conway, Pisoni, and Kornenberger (2009) specifically involved *sequential* motor skills. The key to the previous

findings likely lies in the sequential nature of the tasks examined. The sequencing aspect of the tasks was not present in the analysis being reported.

On the other hand, Viholainen and colleagues (2002) demonstrated that in typically developing children, further distinctions may be more useful than a simple classification of motor skills into “fine” and “gross” motor skills. This distinction was not present in the data set.

Given the base of literature showing that language acquisition begins with very basic, automatic parsing of sounds into semantic and syntactic units, (e.g. Saffran, Aslin, & Newport, 1996; Izura, 2011; Mampe et al., 2009; Saffran, 2003) one would likely assume that activities involving fundamental units of language, such as letter/sound activities, would be important for language development. However, the finding in the current study implies that this is not the case. Perhaps in early infancy, low-level perceptual/motor skills allow language acquisition to be possible for young humans, but this need disappears as more complex cognitive skills emerge. Another possibility is that as language bootstraps onto domain general knowledge of rule structure and semantics, the relationship between perceptual/motor skills and language disappears.

However, the most important conclusion of the present study is the role that social interaction plays in language development. Recently, Kuhl (2003) demonstrated that in early infancy children may need social interaction to acquire even basic language components such as phonology. The present findings support this claim at an even older age. Social interaction was important for the language skills of both bilingual and monolingual children (Palermo and Mikulski, 2014; Roseberry, 2014; Tare and Gelman, 2011).

However, for the monolingual children, personality characteristics that may allow them to engage more freely in language interactions with others were predictive, whereas the most important factor for bilingual children was the relationships with adults in the classroom, though in some cases these relationships were inverse. Both experiments showed that simple adult interaction positively predicted OWLS scores regardless of the child’s language status. This finding indicates an important relationship between adult engagement and language outcomes for all children, regardless of their language experience. However, there was an inverse relationship between teacher scaffolding/encouragement and OWLS scores and between second language engagement and OWLS scores for the bilingual children. While this finding may seem surprising, two possible explanations exist for this pattern of results.

The first involves methodological issues in developmental research. One explanation of the results of the path model is that children who have poorer language skills need more scaffolding and second language interaction in the classroom than children who can use language more efficiently. Thus, the negative predictive power seen for teacher scaffolding and engagement in a second language may be an artifact of the observation. Instead of interpreting the result as teacher scaffolding or second language engagement leading to poor language outcomes, it is as likely that the OWLS scores of poor language learners were already depressed, and therefore correlated strongly with teacher scaffolding and second language engagement, as the educator attempted to engage these students in classroom activities.

The other explanation involves the use of lower level perceptual motor processes already alluded to in this section. Informal interactions with adults lend themselves to implicit processing and implicit learning of the abstract structure of language. Teacher scaffolding and engagement in a second language, on the other hand, are more likely to take the form of explicit instruction about language or another academic area. Thus, in keeping with cognitive theory on language learning, it is possible that this pattern of results reflects the gains apparent in implicit language learning

(Buac, et al., 2014; Highman, 2013; Peeters, 2009). It has been shown that structures that are typically learned implicitly, as in the case of an artificial grammar mimicking a simplistic natural language grammar, are more difficult for people to learn when they try explicitly to look for patterns in the stimuli (Reber et al., 1980). For monolingual children, in whom the abstract rule structure of English is already rigidly engrained, this effect is not likely to be seen as strongly. For bilingual children, who are still learning the structures of the English language, informal interaction that allows them to pick up the rule structure outside of formal language training may be more effective to overall language outcomes than explicit instruction (Barac et al., 2014; Bridges and Hoff, 2014; Chen, 2013).

The finding that social personality characteristics were predictive of language scores for monolingual but not bilingual children is likely due to a relationship between sociability and language skills. On the one hand, children who are competent in English may be more likely to engage with peers, feel competent, or be assertive. On the other, children who possess these traits are likely to engage more with others, thereby enhancing their language skills. It is possible that this effect is bidirectional, with sociability scaffolding language and language scaffolding sociability. This pattern of results is consistent with the idea of limited or subtractive bilingualism laid out in an earlier section (Collier, 1989; Hambly, et al., 2013; Lunden and Silven, 2011; Pena, 2012). In the case of subtractive bilingualism, children from a second language speaking background may use social cues such as how valued their native language is by mainstream culture, to determine the level of investment placed in their native language (Brito and Barr, 2012; Cattani, et al, 2014; Dixon, et al., 2012). This is important because the continued growth of linguistic awareness in the first language appears to lead to higher meta-linguistic awareness across both languages (Collier, 1989).

In light of the present results, instruction in the classroom that warrants implicit interpretation is likely to be most effective in bilingual classrooms. This is similar to “submersion” or “immersion” language learning (Hammerly, 1987; Hickey, 2014). These methods use instruction in the student’s second language to help the student attain proficiency in that language. By being exposed to the second language in a naturalistic context, second language learners receive richer language input from which they can draw implicit language structure. Given the extensive work on a sensitive period for language, (e.g. Arshavsky, 2009; Bialystok, 2014; Brito and Barr, 2012; Hamby, 2013; Hernandez, Li, & MacWhinney, 2005), it follows that exposure to implicit rule structure may be even more important for young children learning a second language than for adult second language learners.

It also appears important for educators to embrace the concept of limited bilingualism, to ensure that students maintain their first language proficiency in order to bootstrap the second language, and attain school-based language proficiency (Cirino, et al., 2007; Pena, 2012; Uccelli and Paez, 2007; Brito and Barr, 2012; Byers-Heinlein, 2013; Kirkham, Slemmer, & Johnson, 2002 Collier, 1989; Cummins, 1979; Hall, Chang, & Carlson, 2006; Landry, Allard, & Deveau, 2009).

Limitations and Future Directions

One caveat to the present study is that the participants were only tested in English. While using English language outcomes is an ecologically valid dependent measure, assuming that the children’s academic institutions predominantly use English for instruction and assessment, it may not reflect overall language skills. For example, a child who learned Chinese as a first language and learned English upon entering school may naturally lag behind monolingual English speaking children, but have superior meta-linguistic skills. It has been demonstrated that bilingual children score higher on tasks involving executive functioning (Bialystok et al., 2010; Morton, 2010), that

their overall vocabulary is at least equal to that of monolingual children (Hoff et al., 2011), and that growth in one language may transfer to growth in the other, indicating scaffolding between multiple languages (Davidson, Hammer, & Lawrence, 2011). Thus, the numerous advantages of being bilingual should not be overlooked. Instead, the results in the present paper should represent differences that bilingual and monolingual children face in English speaking classrooms.

Likewise, the present paper explores language growth over a roughly 1.5 year period of time. Though a 1.5 year period represents a large percentage of a child's life in preschool and kindergarten, much remains to be studied about language growth in later childhood. Whether monolingual and bilingual children develop to have similar language needs is an empirical question that remains to be seen. Thus, longer longitudinal studies as well as cross-sectional studies are necessary future work.

In summary, the present study demonstrates the importance of social interaction in early childhood language outcomes. Taken together, the analyses show that interactions with peers, teachers, and parents are important for language development, and may be especially important for the development of English language skills in bilingual children.

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A Comparative Study of the International Perspectives of Six-Graders in Taipei and Shanghai

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Abstract

With the emergence of globalization, it has become increasingly important for all citizens to possess an international perspective. The trend of internationalizing educational systems has also emerged in various countries. Thus, to explore the degree to which students can possess international perspectives is an important topic worthy of studying. The purpose of this study was to develop a questionnaire to investigate the current status of the international perspectives of and the differences between sixth graders in Taipei and Shanghai. A total of 1,300 sixth -graders were randomly stratified from the two cities, with 1,111 valid questionnaires returned for further analysis. A significant difference was found in sixth graders' international perspectives between the two cities. Differences of their demographic characteristics were also identified. More similarities than differences in their backgrounds and experiences were identified. Both similarities and differences were also found in their parents' level of education and occupation.

Keywords: International Perspectives; Internationalization; Sixth Grader; Comparative Education.

Introduction

With regard to the emergence of globalization, it has become increasingly important to possess an international perspective for all citizens. In the case of the educational system, an emphasis on the internationalization is also formed and seen as a new trend in the educational policy in various countries around the world. Two major global events—"Expo 2010 Shanghai China" and "2010 Taipei International Flora Exposition"—were held in Shanghai City and Taipei City, respectively. Residents of Shanghai and Taipei participated cheerfully and enthusiastically in these world-class activities along with visitors from around the world. It seems that teachers, parents, and students in these two cities have the opportunity to expand their international perspectives through such international events.

It is important to have a general picture of the people's international perspectives of Taipei and Shanghai in a broader scope prior to 2010. According to a survey of new social comers conducted by Pan Asia Human Resources Management & Consulting Corporation in 2004, Taiwan's young people are not interested in international news. In addition, Du (2011) found that Taiwan's young people pay less attention to international news than their counterparts in Mainland China. In terms of the content of international news, Taiwan's young people pay more attention to entertainment and sports news than others, whereas Mainland China's young people pay attention to information relating to international as well as political and economic news. Another important survey entitled "Global village of Citizen: A Questionnaire Survey of International Perspective," conducted by King Car Education Foundation, sampled senior high school and college students in Taiwan. The survey found that 86% of students recognize the importance of international perspectives; the main motivation for understanding international affairs is to enhance their competitiveness so as to become one of the international talents needed for business and industry.

However, little research has dealt with elementary school students. Do these students hold appropriate international perspectives? This question led to the current study, whose purpose is to develop a questionnaire in order to investigate the current status of the international perspectives of sixth graders as well as the differences in these perspectives between two targeted cities: Taipei and Shanghai. The research results can serve as a guideline for future curriculum design in elementary and junior high schools in greater China. The research questions are as follows:

1. What is the current status of international perspectives among sixth graders in Taipei? Do their backgrounds have any influence on their perspectives?
2. What is the current status of international perspectives among sixth graders studying under the nine-year integrated curriculum in Shanghai? Do their backgrounds have any influence on their perspectives?
3. Is there any difference in the international perspectives of sixth graders in Taipei and Shanghai?

Literature Review

Theoretical Foundations of Expanding International Perspectives among Students

It is generally believed that if we want to expand students' multicultural understanding and respect of differences, the best way is to help students learn about others. The idea of international education is based on this assumption, and international education and the

international perspective of teaching are based on theories of multiculturalism and multicultural education. Morey (2000) asserted that globalization has reinforced the demographic changes in the world. The diversification of people has become more significant. Schools around the world have changed their teaching materials to meet the needs of an internationalizing society, and one important mission is to prepare students with the awareness and skills necessary in a multicultural society.

Another significant theoretical foundation of expanding international perspectives among students is what policy researchers have asserted are the rationales driving the internationalization of education. The drivers of enhancing school's internationalization level and students' international perspective are human resource development, strategic alliances, commercial trade, nation building, and social/cultural development (Knight, 2004). Thus, enriching students' international perspectives can be an effective way of developing human capital, grounding social harmony, and strengthening national competitiveness within a nation state.

Empirical Studies of International Perspectives among Students

In the era of globalization, it is very important to possess an international perspective; ideally this should begin being cultivated during childhood (Li, 2007). But exactly what do we mean by "international perspective"? This is a hard concept to precisely define. Many scholars have defined international perspective according to the characteristics and attitudes of those who hold such a perspective. Liu (2006) suggested that the requirements for the cultivation of an international perspective include (1) foreign language aptitude; (2) interest in international affairs; (3) sensitivity to international culture; (4) an understanding of international issues; and (5) an understanding of globalization. Li (2007) asserted that an international perspective represents open-mindedness, a non-regional-centered orientation, a spirit of non-discrimination, and the active pursuit to make friends.

The increasing importance of students' international perspective is also evident in relevant international studies. For example, an online survey released by International Educator in August 2010 revealed that Canadian undergraduate students believe in the benefits of international education and overwhelmingly think that the ability to work in culturally diverse settings is important in terms of securing a job after graduation. Similar findings also can be found in other studies (e.g., Craiga & Piskurb, 2012; Green et al., 2008; McIntyre, 2013; Sandell, 2007).

McKenzie (1998) asserted that there are at least five definitions of "international," and the term "international perspective" can be defined in various ways as well. Hayden et al. (2000) suggested that "being international" refers to a specific set of attitudes, beliefs, values, and behaviors. However, practical acts such as language competence and travel opportunities are not to be excluded (Mo, 2006). Therefore, the current study defines international perspective as "one's views and knowledge regarding other nations and cultures"—a kind of international and intercultural competence which might be referred to as "cross-cultural awareness" or "international understanding."

Hayden, Rancic, and Thompson (2000) pointed out that previous studies of measuring international perspectives have seen school and peers as important sources of students'

international perspectives. However, very few studies had tested the significance of parental influence on students' international perspective. Thus, Hayden et al. (2000) included "parents who are internationally minded" as an item to measure students' and teachers' international view, considering it an important but consistently neglected source of students' international perspective.

Wihlborg (1999) studied the international perspectives of freshmen and sophomores majoring in nursing education in Sweden and defined their international perspectives based on "conceptions of internationalization." In a previous work on the subject, Sampson and Smith (1957) developed the World-mindedness Scale, which they defined as viewing the problems of mankind from an international perspective, without necessarily including interest in or awareness of international affairs, as does the concept of "international-mindedness." In sum, what all these terms have in common is that they represent the fact that an individual possesses some sort of international perspective.

Based on these definitions of international perspective formulated by both Chinese and Western scholars, it can be generalized that the concept includes an interest in international affairs, sensitivity to international culture, a broad outlook, and genuine concern about international issues. One's international perspective is related to one's knowledge and common sense about international issues and foreign cultures. In terms of competence, one of the requirements for cultivating an international perspective is foreign language ability in order to facilitate travel and access to international media outlets. In brief, having an international perspective means that one has international interests, attitudes, and values as well as the ability and willingness to put them into practice.

In investigating individuals' international perspectives, most scholars have applied a quantitative approach with a psychometric questionnaire (Gerner et al., 1992; Hayden et al., 2000; Lam & Selmer, 2004; Mo, 2006; Sampson & Smith, 1957; Wang, 2004), while few studies have used a qualitative approach (Wihlborg, 1999). To understand a targeted group of cross-cultural samples' international perspectives, three categories of content-specific items were developed and used in constructing the research tools of these studies.

First, Hayden et al. (2000) originated a 32-item questionnaire with a 5-point Likert scale to examine 1,263 eleven-year-old international students' international perspectives of 75 different nationalities. A nine-dimension subscale was used in this study: international experiences, parental factors and type of institution attended, second language competence, neutrality, open-mindedness, attitude toward other value systems and culture, attitude toward one's own values systems and culture, respect for others, and tolerance of the behavior and views of others. This influential instrument was translated into 56 languages and has been frequently used or adopted in subsequent studies internationally (Lam & Selmer, 2004). Lam and Selmer (2004) applied the same structure of this questionnaire to compare the international perspectives of two groups of adolescents with an average age of 14: 63 British expatriate adolescents living in Hong Kong and 88 local British adolescents who had never lived abroad. Mo (2006) subsequently obtained permission to directly translate this questionnaire, and then used the same content structure to

measure the international perspectives of 540 adolescents studying at international schools in Taiwan.

Second, the World-mindedness Scale (W-Scale) developed by Sampson and Smith (1957) was also used internationally to explore individuals' degree of acceptance and respect for international situations. An eight-dimension subscale with 32 items was used in this world-mindedness instrument (i.e., religions, immigration, government, economics, patriotism, race, education, and war). In Taiwan, Wang (2004) combined the content structures from both the W-Scale (Sampson & Smith, 1957) and Hayden et al.'s (2000) questionnaire on students' perceptions about being international to re-design a preliminary scale and evaluate its suitability. She administered this adapted questionnaire to 1,545 undergraduates and 960 graduate students from 63 departments at 30 different universities. The final 25-item scale included four dimensions: international experience, open-minded thinking, understanding of international relationships, and cross-cultural awareness.

Third, Wihlborg (1999) applied a phenomenographic approach to interview 25 Swedish student nurses in order to describe their conceptions of internationalization. Five themes concerning issues about internationalization were used for the interviews, which intended to focus the conversations and to understand targeted students' conceptions. A perspective of internationalization that included three dimensions—international understanding, an international way of thinking, and an overall understanding of internationalization—was proposed in this study.

Furthermore, in recent years, various countries have begun to increasingly promote international education in elementary and junior high schools (Librera, Ten Eyck, Doolan, Morse, & Jensen, 2005; McConnell, 2000; Sachar, 2004) in the belief that the results are much better when the cultivation of an international perspective begins in childhood. Moreover, in order to lay the foundation of international education at the elementary or junior high school level, it is stipulated in the EU educational policy that the training of teachers must include an international perspectives component (Dooly & Villanueva, 2006). Many studies have also stressed the importance of the promotion and cultivation of an international perspective by teachers (He, 2001; Dooly & Villanueva, 2006; Wihlborg, 1999). For younger learners, such as students in elementary and junior high schools, the cultivation of an international perspective relies on their teachers' views and attitudes in particular. In fact, teacher competence is critical to the effective implementation of any curriculum designed to generate interest in international issues and foreign language ability. Finally, parental behavior and attitudes, as well as opportunities to go abroad, are related to one's family and socioeconomic background, and these clearly have an influence on a student's international perspective.

Together, these three categories of content-specific dimensions can be considered to obtain a comprehensive picture of students' perspectives of "being international." In the current study, which intended to explore and compare students' conceptions in two targeted cities, the importance discussed above was also reflected in constructing the theoretical framework. To get a better understanding of the two cross-cultural groups, Hayden et al.'s (2000) nine-dimension instrumental structure was primarily used to design the questionnaire for this comparative study in addition to taking account of those considerations in domestic studies (Mo, 2006; Wang, 2004).

Based on the above literature review, most existing studies surveyed high school or college students' international perspectives, but there are relatively fewer or even no empirical studies focusing on primary school students. However, in many countries, policy suggests cultivating citizen's international perspectives at an early age (e.g., Australia Victorian Government, 2012; Ministry of Education in Taiwan, 2011). Thus, it is important to empirically explore primary school students' international perspectives. Our research can help educational practitioners have a clear picture of the degree to which primary school students possess international perspectives and improve their teaching practices based on our findings. Most importantly, the significance of this research is its contribution of comparing the international perspectives between mainland China and Taiwan. Since mainland China and Taiwan share the same culture and ethnicity but were separated for more than 60 years, it is highly valuable to compare students' international perspectives in these two culturally similar but politically different states. The two cities selected, Taipei and Shanghai, are both the most internationalized financial centers in their respective countries, making them comparable cases that can generate further implications for policies and educational practices.

Research methodology

A survey method was employed in this study. The Questionnaire on the International Perspectives of Elementary School Students was administered to targeted sixth graders in Taipei and Shanghai to gather the data. Corresponding statistical analyses were applied to obtain the findings in order to reach the research objectives.

Participants

As stated in the research questions, this survey study aimed to investigate targeted sixth graders' international perspectives in two cities. Reflecting the cross-cultural characteristic of this comparative study, these two cities were representational areas within Chinese society, where students and their parents lived in a multi-cultural and modern environment with diverse classes of SES and abundant opportunities of being in touch with international experiences. In order to obtain substantial samples from the two cities, a sampling criterion was applied for extracting representative participants (Creswell, 2008): A stratified random sampling method (by administrative districts) was employed, and 1,300 sixth graders (650 from each city) were randomly selected from elementary schools in both cities. In Taipei, 650 questionnaires were distributed to 12 administrative districts; 611 valid questionnaires were returned (return rate = 94%). In Shanghai, 650 questionnaires were distributed to 11 administrative districts; 500 valid questionnaires were returned (return rate = 77%).

Research Tools

Based on the literature review, The Questionnaire on the International Perspectives of Elementary School Students was developed using the content structure of previous studies (Hayden et al., 2000; Mo, 2006; Wang, 2004). After completing the preliminary framework of the questionnaire, 10 elementary school teachers offered feedback, which was incorporated into the design of the preliminary draft of the questionnaire. Upon completion of the preliminary draft, five professors in relevant fields and two elementary school principals evaluated the appropriateness of its

content (i.e., expert review of validity), based on which a pre-test questionnaire with 30 items was developed. Next, 220 sixth graders in Taipei and Shanghai were randomly selected as pilot participants. After the reliability and validity analyses were conducted on the pilot data, one item was deleted to form the formal questionnaire (see Appendix). This formal questionnaire consisted of two parts: international perspective and demographic characteristics.

International perspective

Based on the factor analysis of the pilot test, three subscales were extracted from the remaining 29 items and named “international experience and attitudes” (Q1–Q6), “parental factors” (Q7–Q12), and “cross-cultural competence” (Q13–Q29). The variances explained by the three dimensions were 66.20%, 13.56%, and 8.19%, respectively, while the total variance explained was 87.95%. The result of the reliability analysis indicated that the Cronbach’s α for the three dimensions was .76, .82, and .94, respectively. The total reliability of the questionnaire was .94, and there was a significant correlation between each of the dimensions. The value of the correlation coefficient ranged between .524 and .743 ($p < .01$). The “international experience and attitudes” subscale included items concerning issues of open-mindedness, flexible thinking, and respect and tolerance for others. The “parental factors” subscale dealt with parental influences on their kids’ international perspective. The “cross-cultural competence” subscale measured issues about cross-cultural understanding, knowledge of international organizations and events, the ability to make foreign friends, and the ability to use foreign languages.

Demographic characteristics

This part collected data on participants’ personal demographic information—namely, gender, level of education, parental occupation, travel experience, study tours, friendship with foreigners, and Internet use.

Data analysis

According to the purposes of this study, corresponding statistical analyses (i.e., descriptive statistics, independent sample *t*-test, and one-way ANOVA) were employed to analyze the data.

Results

The results of the data analysis are divided into three parts: the international perspectives of sixth graders in Taipei; the international perspectives of sixth graders in Shanghai; and a comparison of the two groups. The value of the total reliability of the questionnaire was .91.

The international perspectives of sixth graders in Taipei

The average international perspective score of the sixth graders in Taipei was 115.29 (the average extent was approximately 79.5%). The means and standard deviations of each aspect are shown in Table 1. The demographic characteristics of the respondents were as follows: The proportion of males and females was 47.5% and 52.5%, respectively. In addition, 36.5% of sixth graders’ fathers had an educational level of high school/vocational high school or below, 43.7% were junior college or college graduates, and 16.7% had M.A.s or Ph.D.s; 39.1% of sixth graders’ mothers had an educational level of high school/vocational high school or below, 47.3% were

junior college or college graduates, and 10.8% had M.A.s or Ph.D.s. As for occupation, 30.0% of parents were employed in the service industry while 20.0% were employed in commerce. Furthermore, 61.5% of sixth graders have traveled abroad or participated in a study tour, 47.0% have made foreign friends, and only 4.6% did not have Internet access at home. Among those with Internet access at home, 34.0% use the Internet twice or less per week, 39.0% use it three to five times per week, and 27.0% use it six times or more per week.

Table 1. Distribution of Sixth Graders' International Perspectives in Taipei

Aspect	<i>N</i>	<i>M</i>	<i>SD</i>	Minimum	Maximum
Experience and attitudes	611	22.94	4.37	7	30
Parental factors	611	22.27	6.79	6	109
Cross-cultural competence	611	70.07	11.75	18	128
International perspective (total scores)	611	115.29	19.01	35	193

In terms of administrative districts, the average international perspective score of the sixth graders in the Zhongshan District was the highest ($M = 122.49$), while that of those in the Wanhua District was the lowest ($M = 108.45$). In addition, there was a significant difference between administrative districts, $F(11, 599) = 2.614, p < .01$. The results of an independent t -test on gender, travel experience, and making foreign friends are shown in Table 2. Finally, a one-way ANOVA indicated that there was no correlation between Internet access at home and frequency of Internet use and the international perspective scores of sixth graders (despite the difference in the frequency of Internet use), $F(6, 604) = 1.369, p > .05$, as shown in Table 3.

Table 2. t -test of Gender, Travel Experience, and Making Friends of Taipei Sixth Graders

Aspect	Gender	Foreign travel experience	Making foreign friends
Experience and attitudes	3.188**	-2.882**	-8.566***
Parental factors	1.979*	-4.686***	-3.82***
Cross-cultural competence	3.885***	-1.862	-6.576***
International perspective (total scores)	3.845***	-3.665***	-7.458***

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

Table 3. *Distribution of Internet Use and the International Perspectives of Taipei Sixth Graders*

Internet access at home and frequency of use per week	<i>N</i>	<i>M</i>	<i>SD</i>
Without Internet (0 times)	28	107.93	16.97
With Internet			
1 time	77	114.35	20.72
2 times	103	115.00	20.66
3 times	111	116.70	17.71
4 times	88	114.93	20.33
5 times	39	111.69	18.70
6 times or more	165	117.24	17.41

As for parental level of education, according to the results of a one-way ANOVA, there was a significant correlation between the international perspectives of sixth graders and their fathers' level of education, $F(6, 585) = 3.90, p < .01$. In addition, sixth graders whose fathers were Ph.D.s had the highest international perspective scores, while those whose fathers were junior high school graduates had the lowest scores. Thus, this finding in Taipei demonstrated the influence of parental educational attainment on students' international perspectives. As for the father's occupation, sixth graders whose fathers worked in the health care industry had the highest international perspective scores ($M = 120.83$); for the mother's occupation, sixth graders whose mothers worked in the field of education had the highest scores ($M = 121.14$). Finally, those whose parents both served as public officials had the lowest international perspective scores ($M = 112.02$ and 112.50).

The international perspectives of sixth graders in Shanghai

The average international perspective score of the sixth graders in Shanghai was 122.55 (the average extent was approximately 84.5%). The means and standard deviations of each aspect are shown in Table 4. The demographic characteristics of the respondents were as follows: The proportion of males and females was 51.9% and 48.1%, respectively. In addition, 50.0% of sixth graders' fathers had an educational level of high school/vocational high school or below, 40.8% were junior college or college graduates, and 8.8% had M.A.s or Ph.D.s; 50.4% of sixth graders' mothers had an educational level of high school/vocational high school or below, 42.6% were junior college or college graduates, and 6.8% had M.A.s or Ph.D.s. As for occupation, 48.0% of parents were categorized as "other," and 18.0% to 27.0% were employed in commerce. Furthermore, 63.4% of sixth graders have traveled abroad or participated in a study tour; 45.0% have made foreign friends; and only 10.8% did not have Internet access at home. Among sixth graders who have Internet access at home, 38.6% use the Internet twice or less per week, 50.4% use it three to five times per week, and 11.0% use it six times or more per week.

Table 4. *Distribution of the International Perspectives of Sixth Graders in Shanghai*

Aspect	<i>N</i>	<i>M</i>	<i>SD</i>	Minimum	Maximum
Experience and attitudes	500	24.65	3.28	13	30
Parental factors	500	23.48	4.85	6	71
Cross-cultural competence	500	74.43	9.28	39	126
International perspective (total scores)	500	122.55	14.57	73	176

In terms of administrative districts, the average international perspective score of the sixth graders in the Pudong New Area was the highest ($M = 130.68$). In addition, there was a significant difference between administrative districts, $F(10, 489) = 6.522, p < .001$. The results of an independent t -test on gender, travel experience, and making foreign friends are shown in Table 5. In both cities, the opportunities of having foreign travel experience and making foreign friends are two key factors enriching students' international perspective. Finally, a one-way ANOVA indicated that Internet access at home and frequency of use were related to a significant difference in the international perspectives of sixth graders, $F(6, 493) = 2.786, p < .05$. The results of the post hoc comparison are shown in Table 6. This finding is quite important in the current society as information technology changes rapidly nowadays and Internet access popularity is still a key to internationalization. A greater use of internet means students can access international information and thus can broaden their sense of international perspective. The differences among students are even more significant in Shanghai. The digital divide is an important variable in the studies of international perspectives among students.

Table 5. *t*-test of Gender, Travel Experience, and Making Friends of Shanghai Sixth Graders

Aspect	Gender	Foreign travel experience	Making foreign friends
Experience and attitudes	2.263*	-3.462**	-3.779***
Parental factors	2.209*	-5.017***	-4.697***
Cross-cultural competence	3.410**	-2.970**	-2.392*
International perspective (total scores)	3.434**	-4.367***	-3.884***

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

Table 6. Analysis of Internet Use and the International Perspectives of Shanghai Sixth Graders

Internet access at home and frequency of use per week	<i>N</i>	<i>M</i>	<i>SD</i>	Post hoc comparison
Without Internet (0 times)	54	115.70	16.087	
1 time	53	121.58	15.789	1 time > 0
2 times	140	123.19	12.691	2 times > 0
3 times	117	123.68	13.194	3 times > 0
With Internet				
4 times	53	126.09	15.699	4 times > 0
5 times	28	123.39	14.609	5 times > 0
6 times or more	55	122.38	16.436	6 times or more > 0 times

As for parental level of education, according to the results of a one-way ANOVA, there was a significant difference in the international perspectives of sixth graders in Shanghai in relation to their fathers' level of education, $F(6, 489) = 5.006, p < .001$. In addition, sixth graders whose fathers were Ph.D.s had the highest international perspective scores, while those whose fathers were elementary school graduates had the lowest scores. As for the father's occupation, sixth graders whose fathers worked as public officials had the highest international perspective scores ($M = 130.20$); as for the mother's occupation, those whose mothers worked in the field of education had the highest scores ($M = 128.47$). Finally, sixth graders whose fathers worked in commerce had the lowest international perspective scores ($M = 119.80$), and those whose mothers were employed as laborers had the lowest scores ($M = 116.50$). The influence of parental education attainment was again demonstrated in Shanghai, but the influence of parental occupation is quite different in the two cities, which could be due to the structural differences of work content and social status among different occupations in the two cities.

Comparison of sixth graders in Taipei and Shanghai

According to the results, a significant difference emerged between the international perspectives of the sixth graders in Taipei and those in Shanghai, $t(1109) = -7.211, p < .001$. In addition, significant differences occurred among the three aspects (see Table 7). Overall, the international perspective scores of sixth graders in Shanghai were significantly higher than those of the sixth graders in Taipei.

Table 7. *Comparison of International Perspectives between Taipei and Shanghai Sixth Graders*

Aspect	City	N	M	SD	t
Experience and attitudes	Taipei	611	22.94	4.37	-7.440***
	Shanghai	500	24.65	3.28	
Parental factors	Taipei	611	22.27	6.79	-3.445**
	Shanghai	500	23.48	4.84	
Cross-cultural competence	Taipei	611	70.07	11.75	-6.901***
	Shanghai	500	74.43	9.28	
International perspective (total scores)	Taipei	611	115.29	19.01	-7.211***
	Shanghai	500	122.55	14.57	

** $p < .01$, *** $p < .001$

Discussion and Conclusions

The results of the questionnaire are summarized in the following subsections, along with the discussions serving as a reference for the design and execution of future studies.

Differences in sixth graders' demographic characteristics

More than 60.0% of the parents of sixth graders in Taipei were junior college graduates or above, which was significantly higher than those in Shanghai (49.8%). The proportion of parents of sixth graders in Taipei with a high educational level (i.e., M.A.s and Ph.D.s) was significantly higher (father 16.7% and mother 10.8%) than that of parents in Shanghai (8.8% and 6.8%, respectively). In addition, the occupation ratios of the parents were significantly different. In Taipei, the largest proportion of parents worked in the service industry (30.0%), while in Shanghai the largest proportion were classified as "other" (48.0%). However, in both Taipei and Shanghai, the second most common occupation (approximately 20.0%) was "commerce." As there was a significant difference in the level of education of the parents, it is not surprising that their occupations varied as well. However, despite these differences, parents' efforts to provide their children with opportunities for cultivating an international perspective were quite similar. More than 60.0% of sixth graders in both Taipei and Shanghai have traveled abroad or participated in an overseas study tour, and nearly half of them have made foreign friends. Furthermore, most parents provided their children with Internet access at home, and more than 60.0% of the sixth graders used the Internet more than three times per week.

With respect to background and experience, the similarities outweigh the differences

Regarding the influence of sixth graders' background and experience on their international perspectives, several similarities were found. First, in both cities, the international perspective scores of the male sixth graders were significantly higher than that of the female ones. This finding is consistent with Lam and Selmer (2004), whose research found significant differences

in the international perspectives of male and female British adolescents in the UK and Hong Kong. Second, in both cities, the international perspective scores of sixth graders who have traveled abroad were significantly higher than those who have not. Third, in both cities, the international perspective scores of sixth graders who have made foreign friends were significantly higher than those who have not. However, as to Internet access at home and frequency of use, there was a significant difference between sixth graders in Taipei and those in Shanghai. In Taipei, neither Internet access at home nor frequency of use significantly influenced sixth graders' international perspective scores. However, in Shanghai, both Internet access at home and frequency of use had a significant impact on sixth graders' international perspective scores. Thus, there needs to be a further examination in the future to clarify this dissimilarity between the two targeted cities.

It was believed this research already highlights important correlations between students' background information and their international perspectives because the previous studies reviewed do not consider as many important background variables as this research and neglect their influential power on international perspective. Hayden et al. (2000) compared students' and teachers' perceptions of international perspectives. Wihlborg (1999) adopted a qualitative approach and generated some important categories of international perspectives among student nurses. Lam and Selmer (2004) focused on British adolescents living abroad and this experience's impact on their international perceptions. The important variables highlighted in this research include Internet use frequency, parental education attainment, parental occupation, and foreign travel and friendship experiences—all of which are worthy of further studies.

This research also suggests that policy makers in both cities should consider design programs for balancing the significant divide of international perspectives among primary school students from different social economic status backgrounds.

Both similarities and differences existed for parents' level of education and occupation

With regard to parents' level of education, sixth graders in both cities had much in common. First of all, there was a clear correlation between sixth graders' international perspective scores and their fathers' level of education; in both Taipei and Shanghai, sixth graders whose fathers were Ph.D.s had the highest scores. Moreover, in Taipei, sixth graders whose fathers only graduated from junior high school had the lowest scores. Similarly, in Shanghai, sixth graders whose fathers had only graduated from elementary school had the lowest scores. However, regarding parental occupation, there were both similarities and differences. In Taipei, sixth graders whose fathers served in the health care industry had the highest scores. In Shanghai, sixth graders whose fathers served as public officials had the highest scores. In Taipei, however, sixth graders whose parents served as public officials had the lowest scores. In both cities, sixth graders whose mothers served in the educational field had the highest scores. In Shanghai, sixth graders whose fathers served in commerce had the lowest scores, and those whose mothers were laborers had the lowest scores. It can therefore be concluded that differences in the parental level of education and occupation lead to differences in the family environment and style of raising children, which likely have a great influence on children's international perspectives. Hence, the findings suggest

that educational policy makers in both cities pay more attention to students from lower SES families if the aim is to promote an international education with equal access for all.

Implications for the future studies and educational practice in the region

This research endeavored to explore the differences in international perceptions between students in Shanghai and Taiwan, and many differences were identified. As previously mentioned, both Internet access at home and frequency of use had a significant impact on students' international perspective scores in Taiwan; however, the effects of the aforementioned two factors on students' perspective scores were more significant in Shanghai. In addition, the effects of parents' occupation and educational level on students' international perspective scores also differ between the two target cities. These are all important and interesting findings. However, as this study was conducted mainly using quantitative methodologies, it is difficult—if not impossible—to understand how these phenomena developed. Therefore, we highly recommend that further research be extended by adopting qualitative methodologies for deeper understandings and appreciation of the aforementioned phenomena.

Moreover, as previously mentioned in the literature review section, Hayden et al. (2000) included “parents who are internationally minded” as an item in their research questionnaire to measure students' international perspective and claimed that parental factors were crucial, but a consistently neglected source of students' international perspective. Although their final research results indicated that parental factors were not very important in affecting students' international perspectives, this research obtained an almost opposite outcome, indicating that parental factors significantly influenced students' international perspectives. Although it was presumed the aforementioned difference in parental effects could be attributed to the cultural differences between West and East in the family relationships, empirical research in the future to ascertain this presumption is essential and highly suggested.

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Appendix

Questionnaire on the International Perspectives of Elementary School Students
(translation of Chinese version)

Part 1: International perspective

Questions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. I know much about other countries and cultures.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I communicate with foreign students via the Internet.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I take notice of news about other countries.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I have friends and relatives from different cultural backgrounds.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I hope to have more opportunities to make foreign friends.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I think that everything happening in the world is significant.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. My parents like to travel abroad.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. My parents pay close attention to international events.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. My parents share with me their opinions on international events.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. My parents encourage me to pay attention to international affairs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. My parents encourage me to travel abroad.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. My parents understand current international events and issues.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. If I go to another country, I accept its customs and cultures.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. If I go to another country, I abide by its rules and regulations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. I am willing to abide by group decisions, even if I disagree with them.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. I can accept my opinions being discussed in a group.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. I can tolerate other people's opinions, even if I disagree with them.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. I am willing to cooperate with students from other countries.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. I am willing to share my experience with foreigners.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. When I meet foreigners, I can understand and accept their customs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. I think that different cultures make the world more interesting.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. I can show respect for foreign customs, even if I disapprove of them.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. If I have a chance, I would like to experience different cultures and lifestyles.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. I am willing to introduce the lifestyle of my country to foreign friends.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

25. When I go traveling abroad, I respect the local customs. ☐ ☐ ☐ ☐ ☐
26. I am willing to correct foreigners' misunderstandings of my culture. ☐ ☐ ☐ ☐ ☐
27. When making friends with others, I'm not biased by nationality or race. ☐ ☐ ☐ ☐ ☐
28. If foreigners misunderstand my culture, I am willing to explain it to them. ☐ ☐ ☐ ☐ ☐
29. I would like to help the citizens of other countries to understand my culture. ☐ ☐ ☐ ☐ ☐

Part 2: Background information

1. Your gender: ☐ 1 Female; ☐ 2 Male.
2. Your father's highest level of education: ☐ 1 Elementary school graduate or under; ☐ 2 Junior high school graduate; ☐ 3 High school or vocational school graduate; ☐ 4 Junior college graduate; ☐ 5 College graduate; ☐ 6 M.A.; ☐ 7 Ph.D.
3. Your mother's highest level of education: ☐ 1 Elementary school graduate or under; ☐ 2 Junior high school graduate; ☐ 3 High school or vocational school graduate; ☐ 4 Junior college graduate; ☐ 5 College graduate; ☐ 6 M.A.; ☐ 7 Ph.D.
4. Your father's occupation: ☐ 1 Military personnel; ☐ 2 Public official; ☐ 3 Education; ☐ 4 Commerce; ☐ 5 Agriculture; ☐ 6 Health care; ☐ 7 Laborer; ☐ 8 Service industry; ☐ 9 Other.
5. Your mother's occupation: ☐ 1 Military personnel; ☐ 2 Public official; ☐ 3 Education; ☐ 4 Commerce; ☐ 5 Agriculture; ☐ 6 Health care; ☐ 7 Laborer; ☐ 8 Service industry; ☐ 9 Other.
6. Have you ever traveled abroad or participated in an overseas study tour? ☐ Yes; ☐ No.
7. Have you ever made a foreign friend? ☐ Yes; ☐ No.
8. Is there Internet access in your home? ☐ Yes; ☐ No.
- If yes, please proceed to the following question about your average weekly Internet use (1 time is defined as at least half an hour of Internet use):
- 8a. How often do you use the internet at home in an average week: ☐ 1 time or less; ☐ 2 times; ☐ 3 times; ☐ 4 times; ☐ 5 times; ☐ 6 times or more.



Using Flipped Classroom Approach to Explore Deep Learning in Large Classrooms

Brenda Danker

Abstract

This project used two Flipped Classroom approaches to stimulate deep learning in large classrooms during the teaching of a film module as part of a Diploma in Performing Arts course at Sunway University, Malaysia. The flipped classes utilized either a blended learning approach where students first watched online lectures as homework, and then completed their assignments and practical work in class; or utilized a guided inquiry approach at the beginning of class using this same process. During the class the lecturers were present to help the students, and in addition, the students were advantaged by being able to help one another. The in-class learning activities also included inquiry-based learning, active learning, and peer-learning.

This project used an action research approach to improve the in-class instructional design progressively to achieve its impact of deep learning among the students. The in-class learning activities that was included in the later flipped classes merged aspects of blended learning with an inquiry-based learning cycle which focused on the exploration of concepts. Data was gathered from questionnaires filled out by the students and from short interviews with the students, as well as from the teacher's reflective journals. The findings verified that the flipped classrooms were able to remodel large lecture classes into active-learning classes. The results also support the possibility of individualised learning for the students as being high as a result of the teacher's ability to provide one-on-one tutoring through technology-infused lessons. It is imperative that the in-class learning activities are purposefully designed as the inclusion of the exploratory learning through guided inquiry-based activities in the flipped classes was a successful way to engage students on a deeper level and increased the students' curiosity and engaged them to develop higher-order thinking skills. This project also concluded that flipped classrooms had promising impact for student learning and achievement in a Performing Arts course in Malaysia.

Keywords: Flipped classroom; curriculum design; blended learning.

Introduction

In recent decades, the student-centered learning approach has shown significant learning gains and has reformed teaching styles in many higher educational institutions globally. Over the past 30 years, more flexible, student-centered classroom teaching methods have been advocated based on the concepts of “discovery” learning and “active” learning (Greitzer, 2002). However, on the other end of the spectrum, in many developing countries, including Malaysia, the teacher-centered learning approach is still widely used and preferred. The teacher-centered learning approach uses lecture-based instruction which is economical and viable for teaching a large number of students at a time. Lecture-based instruction is where the teacher takes the active role of dispensing knowledge in a classroom. The propagation of information is in a one-way direction. In such an environment, the students are passive learners, where they rely on learning by listening, memorizing, and on the repetition of the taught knowledge. The major shortcoming in passive learning is that students only have a basic recollection of knowledge - which means they have merely achieved a low level of thinking skill. To attain a higher and conceptual level of thinking, the students need to take responsibility for their own learning and become active knowledge seekers. The student-centered learning approach emphasizes engaging learners to structure their learning to include applying their current class work or experience when they collaborate to solve problems, and make sense of their learning. With this approach, students become active learners and the teacher’s role now moves to that of being a facilitator by initiating classroom discussions to ensure that all the students achieve understanding for meaningful and effective learning (Goh, 2012). The student-centered approach should be at the heart of our educational system and this calls for a paradigm shift in higher educational institutions in Malaysia - to move from the teacher-centered approach to the student-centered approach.

Technology in education can be used as an approach that focuses on student-centered education and is a step in the right direction as we move forward in the 21st century. According to the latest Speak Up survey from Project Tomorrow in the United States which polled 400,000 teachers, administrators, students and parents, videos for homework are on the rise; mobile computing is “beyond the tipping point”; and most students do not use traditional computers to connect to the Internet at home (Riedel, 2014). When teachers effectively integrate communication technologies in their teaching, they create engaging learning environments, especially as students have already adopted technology in their lives and use it increasingly for learning. Higher educational institutions cannot ignore technology in fulfilling their strategic mission and in responding to the expectations of a diverse student body (Donnelly, 2009), as technology-rich classrooms have shown an effect on the students’ achievement.

In moving away from the lecture model to an instructional design involving interactive pedagogy and technology, many educators are paying attention to the Flipped Classroom ideology. YouTube Teacher’s Studio educator, Ramsey Musallam, (2011) suggests using teacher produced videos to shift the form of instruction from the classroom to the homework setting in the Flipped Classroom approach. Students watch recorded lectures for homework and complete their assignments, lab work and tests in class (Hertz, 2012). This allows the lecturers to work with the students during class on what was formerly given as homework. In this way, the lecturers are present to help the students and the students can also help each other (Pink, 2010). Early pioneers of the Flipped Classroom model - Bergmann and Sams, when flipping their classrooms, used the online material mostly to review and reinforce classroom lessons and the classroom becomes the place to work through problems, advanced concepts, and engage in collaborative learning (Tucker, 2012). Holmes, et al. (2001) considered that collaborative learning was “an approach to learning in which students not only construct their own knowledge as a result of interaction with

their environment but are also actively engaged in the process of constructing knowledge for their learning community”.

Peer learning was the other in-class learning activity practiced in the project. Peer learning is one method to encourage meaningful learning and involves students teaching each other and learning from each other (Keppel, 2006). It involves a sharing of ideas, knowledge and experiences and emphasizes interdependent as opposed to independent learning (Boud, 2001).

Flipped classrooms also draw on concepts such as active learning, student engagement, hybrid course designs, and course podcasting (Educause, 2012). It overlaps other instructional tools, such as reverse instruction, inquiry learning, blended learning, and online instruction, through the use of podcasting or screencasting, Web 2.0 resources, and inquiry activities (Bennett, et al., 2011). The vocabulary of active learning needs to be highlighted here as it is an essential in-class instructional method in the flipped classrooms. Active learning is defined by the engineering education community as the “involvement of students in their own learning” and encompasses a variety of instructional techniques in which students participate in activities during class time that involve more than passive listening (Zappe et al., 2009). The core elements of active learning are student activity and engagement in the learning process (Prince, 2004). The flipped model puts the responsibility for learning more on the shoulders of the students while giving them greater impetus to experiment. Activities in class can be student-led, and communication among students can become the determining dynamic of a session devoted to learning through hands-on work (Educause, 2012).

This study used the Flipped Classroom approach during the teaching of a film module as part of a Diploma in Performing Arts course at Sunway University, Malaysia. The course offers a unique curriculum that covers both filmmaking and theatre. As the course is practical-based, the student intake has been at a comfortable enrolment of an average of 20 students per year. In the past two years, there was a sudden increase in class size to 38 students (the highest so far). This presented new challenges to the faculty to engage all students and having sufficient class time for individualized attention during the class. To stimulate students’ deep learning in this largely practical-based diploma course, the flipped classroom approach was used.

Student Learning and the Flipped Classroom

The flipped classroom promotes an environment which increases the interaction between the students and teachers and engages the students in learning through application and practice. In this aspect, flipped classrooms use a student-centered approach as it focuses on student learning and it places the responsibility for learning more on the shoulders of students than teachers while giving them a greater impetus to experiment (Sams, 2011). This can be seen from - the Bergmann and Sams’ instructional design - where students explore and make sense of their learning through active learning activities like inquiry learning, problem-based learning and peer collaboration (Sams, 2011). This creates the face-to-face time to have a “much deeper interaction” between the teacher and student as they engage and interact on case studies, and discuss particular problems (Leckhart & Cheshire, 2012; Gerstein, 2011). The learners are able to demonstrate what they have learned and to apply the material in a way that makes sense to them. As learners make sense of their learning, they create something that is individualized, and with application to the learners’ everyday lives, it extends beyond the lesson. This is the highest level of learning under Bloom’s Revised Taxonomy of Learning (Gerstein, 2011). Zappe, Leicht, Messner Litzinger, and Lee (2009) flipped a large undergraduate architectural engineering course and the students’ evaluation of the course indicated that the flipped classroom had a positive impact on student learning as the students perceived the method of teaching as being more effective than lecturing and reported

that they enjoyed the class and benefited from watching the lecture videos outside of class (Herreid, 2013).

The Flipped Classroom promotes personalized learning as students can pause, re-wind and re-watch the online video at their own pace - one of the major, evidence-based advantages of the use of video is that learners have control over the media with the ability to review parts that are misunderstood, which need further reinforcement, and/or those parts that are of particular interest (Gerstein, 2011). This has a positive effect on student learning and achievement. For example, in 2009, after they flipped their classrooms, Clintondale High School in Michigan, U.S, had a dramatic decrease in the failure rate in critical subjects, such as English Language Arts – which was from 52% to 19% (Álvarez, 2011).

Flipped Classroom in a Large Class Size

Large classrooms are the norm in higher educational institutions in Malaysia. In a study on large group teaching in a Malaysian private university, researcher Susan Thomas assumes that an average class in Malaysia has more than 80 students (Thomas, 2011). The maximum class size for writing classes should be 20 or less, as recommended by The Conference on College Composition and Communication, a professional organization within the National Council of Teachers of English that focuses specifically on college writing (Horning, 2007). In large classrooms, engaging the students together is a challenge even more so when using traditional approaches to teaching - which research has demonstrated to be less effective than more interactive methodologies (Schell, 2012). Implementing a flipped classroom for a large class size may boost the students' academic attainment as it generally enables more focused teaching and learning to take place in the classroom despite the class size (Kachka, 2012). The flipped classroom's online material enables teachers to coach large classes: one-on-one tutoring, scaled by the web (Leckhart & Cheshire, 2012). As for its in-class teaching approach, small group discussions, peer-learning and inquiry-learning have been used to engage students in their learning, even for a large class size. In a large classroom of 209 students, Rick Sellens, a professor at Queens University in Canada, uses the Flipped Classroom with Peer Instruction. Despite the large enrolment, Sellens says: "I was able to get students engaged and talking to each other about the subject matter using Peer Instruction" (Schell, 2012).

Limitations of the Flipped Classroom Approach

An effective flipped classroom requires careful preparation and there is concern regarding the amount of time and effort the instructor has to put in. Recording lectures requires skill and time on the part of the faculty. Moreover, out-of-class and in-class elements must be carefully integrated for students to understand the model and be motivated to prepare for the class. A teacher, Roshan, admits that the process is time-consuming – about one hour and 15 minutes to record and edit a 30-minute lecture. But then, instead of lecturing in class, Roshan spends the class time "just walking around seeing what [students] need help with... they're able to work at their own pace" (Houston & Lin, 2012). As such, introducing a flip can mean additional work and may require new skills for the instructor, although this learning curve can be mitigated by approaching the model slowly (Educause, 2012). It takes effort, but planning, implementing and revising are all doable tasks and each effort builds a block upon which the next can be built. The important component of this process is to develop high-level, engaging questions that serve to deepen students' thinking and to address misconceptions in the lesson (November & Mull, 2012).

Hertz (2012) raises the issue of students' access to the Internet. A common concern in the flipped classroom process is regarding students who have poor or no Internet access outside of class

since the activities outside of class rely on technology. To mitigate this, lecture videos should be converted into a format that can be accessed by students through various means - laptops, tablet computers, smartphones and DVD players. The school faculty can also ensure that the computers in the library and labs are available for students to preview the videos before class. Twomey (2013) documents how a rural high school in Illinois, the United States completely flipped the lessons. In this largely high-poverty area, problems with access to the internet were solved by downloading the lessons onto DVDs and thumbdrives.

Another concern, which pertains to education in general, is when the student does not do the homework, in this case, to watch the online material before class. A flipped class requires students to be willing to take responsibility for their learning. While the focus of the Flipped Classroom is no longer the faculty as the “sage on the stage” but rather the “guide on the side”, it provides a setting where students receive personal attention still held accountable for actions and academic performance (Hawks, 2014). Students who do not watch the online material before class will not be able to participate in the in-class activities fully and proceed to the application tasks. To ensure greater compliance, instructors can track the knowledge gained from the homework or they can adjust the class activities for unprepared students, if they are in fact unprepared (Kachka, 2012). This might be achieved by insisting that the unprepared students watch the video during class time (the preparatory work that is required so as to be able to proceed to the application tasks) while the rest of the class deepens their knowledge through other activities, i.e. the unprepared student misses out part of the class interaction at the beginning of the class and joins the class once the video is viewed.

Implementing the Flipped Classroom

The process of just flipping a classroom will not transform students’ learning. According to a study by Houston and Lin (2012), a successful implementation of a flipped classroom would need the videos to be relatively short (no longer than 20 minutes) and teachers should briefly review the course content before in-class activities to answer any questions and to make sure that the majority of the students have sufficient understanding of the material. Kachka (2012) recommends that during the in-class activities, the teacher must be deliberate to guide and increase the interaction with the students. In addition, the instructional design using technology needs to be carefully planned to ensure the students’ learning experience is enhanced, where students identify learning as their goal. Ramsey Musallam, who began flipping his classroom in 2006, stressed this, saying, “(a) flipped classroom is a thing you do in the context of an overarching pedagogy [and is] not the pedagogy itself” (Ash, 2012). The Flipped Classroom has a comprehensive instructional model that includes direct instruction, inquiry, practice, formative and summative assessment and many more elements (Bennett, et al. 2011). These instructional techniques give a focus to the process of learning. It is aimed to enable students to be more actively engaged with the course material and, ultimately, empower them to construct knowledge through their understanding.

Student’s characteristics of their approach to achieve deep learning were identified from The Higher Education Academy in the UK, compiled from Biggs (1999), Entwistle (1988), and Ramsden (1992), and were used in the scope of the themes explored in this study. Students who want to achieve deep learning have the intention of understanding, engaging with, operating in, and valuing the subject. As such, the thematic analysis shows that deep learning occurs when students:

1. Look for meaning in their learning

2. Interact actively and
3. Relate new and previous knowledge (Higher Education Academy, 2011).

It is anticipated that the research undertaken here will explore the depth of learning for tertiary students in a module for the Diploma in Performing Arts qualification at Sunway University, a practical-based course. The students were from two cohorts that had a large class size.

Research Purpose

The major research questions in this study were:

1. How does a Flipped Classroom approach engage the students in deep learning including looking for meaning in their learning, interacting actively and relating new and previous knowledge despite being in a large class?
2. Within the Flipped Classroom Approach, does including guided exploration by the student improve aspects of deep learning such as looking for meaning, interacting active or relating new and previous knowledge?

Research Method

This study uses an action research approach, in line with the research query - which is to investigate what in-class instructional design for a large class sizes can be used to increase the interaction between the teacher and the student and between the student and another student, with the intention of stimulating deep learning. The instructional design using a flipped classroom strategy can be improved progressively in later flipped classes to achieve its impact of deep learning among the students.

To investigate if students were engaged in deep learning in a flipped classroom, a qualitative research method was used, with questionnaires, short interviews and observations. The first source of data - questionnaires focusing on the online lecture - were given to the students immediately after each flipped class. The second source of data - short interviews with a small sample of the two cohort groups of the program - were semi-structured, with key questions asked on their experience or behavior in the flipped class, their knowledge of the topic taught, and their learning in the flipped classrooms. The study sampling had 19 students (nine from the first year cohort and 10 from the second year cohort). The final source of data was from the researcher's personal reflection, abstracted from observational logs written during the flipped classes and from reflection notes written soon after each class.

First Cycle

In this study, the student-centered learning approach with an instructional design using technology was drawn up to encourage active learning and higher-order thinking skills within a large class size. The study was done in two cycles, involving two cohorts of the Diploma in Performing Arts students from the Department of Performance and Media, Sunway University. The first cycle was conducted in the Scriptwriting course in the August 2012 semester. With 32 students from the second year cohort of the program, two flipped classes were held. The second cycle was conducted in the Video Tools course in the April 2013 semester. With 33 students from the first year cohort of the program, two flipped classes were held.

In the first cycle of the flipped classroom, the students' learning cycle consisted of two stages, as outlined in Figure 1. The first stage involved the students viewing an online lecture as homework before class. The second stage involved the students engaging in active learning in class where they worked out real-world projects to grasp the context of the taught topic. In-class learning activities included peer instruction, problem-based learning and collaborative work.

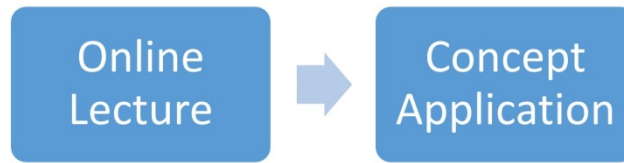


Figure 1. Students' learning cycle in Flipped Classroom Cycle 1

The model of instruction for the second cycle of the flipped classroom was improved after the researcher's continued reading of literature on achieving deep learning among students and reflection on the observation notes and questionnaires from the first cycle of the flipped classes. According to Flipped Classroom instructor Ramsay Musallam, when flipping his classrooms to achieve meaningful student learning, he would include the "Explore" phase, where students would work through guided inquiry exercises. This is based on the Explore-Explain-Apply inquiry learning cycle developed by Robert Karplus (Musallam, 2013). The in-class instruction merged aspects of blended learning with an inquiry-based learning cycle.

Second Cycle

The flipped classrooms for the second cycle consisted of three stages, as outlined in Figure 2. The first stage involved in-class learning activities focusing on exploration of concepts where students would perform hands-on activities designed to investigate the concept, and included discussion on various probabilities with the intention to lead to an understanding of the concept. The second and third stages were similar to the students' learning cycle in the Flipped Classroom Cycle 1, which was to preview an online lecture, followed by concept application in class. In the case of students who did not watch the online lecture before class, they were asked to watch it at the beginning of the lesson and, after watching it, resume class to take part in the active learning phase of the course.



Figure 2. Students' learning cycle in Flipped Classroom Cycle 2

Results and Discussion

In analyzing the qualitative data, a thematic analysis was carried out within the scope of the themes determined by the research question framework of the study - which is, how the Flipped Classroom approach can engage students in deep learning despite being in a large class. Among the themes explored were students looking for meaning in their learning, interacting actively and relating new and previous knowledge despite being in a large class. Within the Flipped Classroom Approach between cycle 1 and 2, data from the students were reviewed to investigate if the guided exploration by the students improved deep learning.

Cycle 1 and 2 results

In looking at students' level of understanding of the topic taught in the flipped classes, results, as outlined in Table 1, show that the average ranking difference for Year 2 (Cycle 1) and Year 1 (Cycle 2) in their level of understanding the topic taught has a slight increase from level 3.9 in Cycle 1 to 4.1 in Cycle 2. Looking specifically at the online lecture 2 carried out in Cycle 1 and 2, as illustrated in Figure 3 and 4, the percentage of the students' understanding at level 5 increased from 30% in Cycle 1 to 44% in Cycle 2. A factor which may have led to the students' increased level of understanding of the topic taught was when inquiry-learning was incorporated in the flipped classes of Cycle 2.

Table 1. Students' level of understanding of the topics taught and the average ranking in the flipped classes

Year 2 Students	Iv 1	Iv 2	Iv 3	Iv 4	Iv 5	Iv 6	Iv 7	Iv 8	Iv 9	Iv 10
Online Lecture 1	4.5	5	4	4	4	4	2.5	4	5	3
Online Lecture 2	5	4	4	4	4	3	3.5	5	3	4
Average ranking of Year 2 students' level of understanding of the topic taught in the flipped classes (Cycle 1).									3.9	
Year 1 Students	Iv 1	Iv 2	Iv 3	Iv 4	Iv 5	Iv 6	Iv 7	Iv 8	Iv 9	
Online Lecture 3	5	4	4	4	4	-	3	4	5	
Online Lecture 4	4	5	3	5	4	3	5	4	5	
Average ranking of Year 1 students' level of understanding of the topic taught in the flipped classes (Cycle 2).									4.1	
Average ranking of Year 2 and 1 students' level of understanding of the topic taught in the flipped classes (Cycle 1 & 2).									4	
Iv	Interviews were labelled numerically.									
0-5	Level of students' understanding of the topic taught with 5 ranked as the highest.									

Online Lecture 2
Flipped Classroom Cycle 1

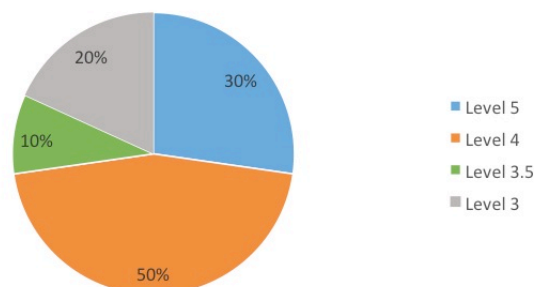


Figure 3. Students' level of understanding of the topic taught in Online Lecture 2 in the Flipped Classroom Cycle 1

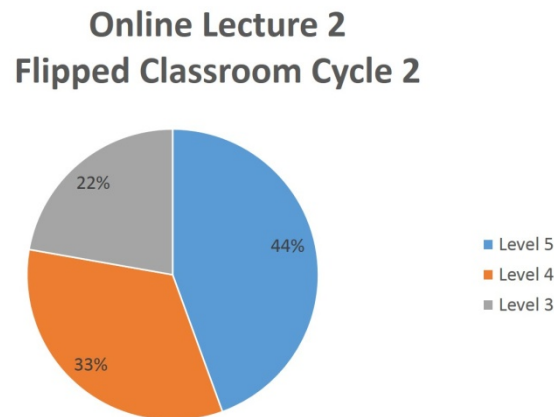


Figure 4. Students' level of understanding of the topic taught in Online Lecture 2 in the Flipped Classroom Cycle

The results also indicated several common issues and themes

Students Look for Meaning in their Learning

In analysing the theme of students looking for meaning in their learning, we first looked for any behaviour trends when the students accessed the lesson online, and also the level of understanding of the topics taught in the flipped classroom. After watching the online lecture, 50% of the Year 1 students reported in the questionnaire that they replayed and paused the online lecture to take notes and to understand the lesson. Relating to their understanding of the topics taught, respondents from both cohorts interviewed had a high understanding, with an average ranking of 4 out of 5 (highest) as outlined in Table 1. In the second flipped class for Year 1 students, 44% of the respondents felt they understood the topic well and ranked it at 5 (as outlined in Figure 3). These results show that most learners are engaged in their learning when using the technology to watch the online lecture. From the nine interview respondents with the Year 1 cohort, one student, after watching the online lecture, even looked for more information online and two students understood the topic well enough to apply it to the personal projects they took on.

When using the flipped classroom model, learning instructions, like inquiry-learning, were implemented in the Flipped Classroom Cycle 2 with the intention for students to make sense of their learning. The results from this study showed that more than half of the respondents (67%) from flipped class Cycle 2 (which taught camera shots size and angles and how to develop stories by using storyboards) found learning engaging and were excited by the ideas taught to try them out themselves. For example, Interview 5 (Year 1) had practiced framing different shots and angles with a camera before class to test the knowledge received. Interview 7 (Year 1) said: "I am a dancer and I wanted to start planning to shoot dance movements using the camera". Three respondents from Cycle 2 began to think about the process for story development. Interview 7 (Year 1) said: "I looked at how stories are from script to visual. I was also thinking of how to shoot stories". Based on the researcher's observation notes, respondents from Cycle 2 were prepared for the lesson and were capable of going straight into the activity. This is in accordance with the increased percentage (from 30% of the Cycle 1 respondents to 67% of Cycle 2 respondents) who reported they were engaged in their learning and were excited to try these ideas

out on their own. A factor which may have led the students to be engaged and energised in their learning was when inquiry-learning (which is the explore phase) was incorporated in the flipped classes Cycle 2. The instructional design with the “Explore” stage in Cycle 2 could have sparked the students’ curiosity and zest for learning as inquiry-learning helps foster critical thinking.

The above results point to how this flipped classroom study helped students to be active learners despite the class size. This setting helped turn what was traditionally passive learning (sitting, listening, taking notes) into a more active, hands-on, student-centred process, by means of technology. The content of the lesson, now delivered to the students online, gives the students the opportunity to reflect and be prepared to be engaged further in class. With class time focused on meaningful learning activities, students also collaborated in small groups to solve problems and use deeper learning processes such as critical thinking. Students from this study showed that they actively sought to transform their own learning from understanding to a higher level of thinking when they engaged in applying and connecting the lesson to their own projects and interests. The flipped classroom model creatively helped these students to manage their own learning.

Students’ Active Participation during In-Class Activities

In assessing students’ participation in class activities, the interview results showed a high participation in all the flipped classes with a majority (more than 70%) saying they gave at least 80% of their attention to the activities. Nearly half of the respondents attributed their high level of participation to gaining new knowledge from the online lecture and in-class activities and finding it interesting.

In engaging diverse types of learners in the in-class activities, it is important to pay attention to students who are introverted or are more of reflective learners. In this study, these learners found it hard to participate as they would rather think through the work than voice their opinions during the in-class activities. 11% of the respondents felt they could have spoken up more during the group activities. Interview 9 (Year 1) said: “I could have done better at participation as I have feedback in my head”. The researcher had observed this and recognised these learners and decided, in future lesson plans, to provide discussion questions ahead of time and to include short reflective breaks during class for these learners to think through the lesson.

In a flipped classroom setup, there is increased interaction between the teacher and the student, and with the student and another student, despite the large class size. One evidence of this interaction is the increased time for feedback. This is seen from the Year 2 interview respondents where 50% of them had a consistent comment on feedback - they either felt they had provided feedback or received useful feedback from their peers and the teacher on the work they did in the in-class activities. Interview 6 (Year 2) said: “Through the activity, my group members gave good feedback on how to improve the conflict in my script”. In the researcher’s observation notes, it was noted that as the students performed the learning activities, the teacher could assess the students’ level of understanding and provide prompt guidance directly. These increased opportunities for feedback could improve student learning. According to Bloom (1984), “an average student who receives one-on-one attention is enabled by constant feedback and a corrective process, and can jump into the 98th percentile of the student population in the academic achievement realm” (Houston and Lin, 2012).

The in-class activities were all conducted in small groups varying from two to five members, depending on the type of activity. The researcher’s notes showed that working in small groups helped students to feel less intimidated to ask questions and express their opinions. In addition to this, an interview respondent from the Year 1 cohort commented that questions were asked

throughout the activities in the class, compared to a traditional classroom, where questions are only asked at the end of the class. This helped draw the students into the learning process.

Students in this study recognised the benefits of active participation in class. They participated as they found the activities interesting, were interested to gain new knowledge in the classroom, and to share knowledge with one another. The class itself was transformed into a bustling learning hub.

Students Connect New and Previous Knowledge

Deep learning involves being able to connect the taught topics to previous knowledge and to the real world. In the thematic analysis of relating the topics taught in their flipped classrooms to new and previous knowledge, 90% of the interview respondents from the Year 2 cohort agreed that it did occur and they were applying the topics taught to their work (The flipped class was about story structure and conflicts in a short film). Interview 2 (Year 2) said: "I can apply this knowledge of storytelling in books whereby I can understand its story structure". In another flipped classroom, all Year 2 respondents could relate the topic taught to film, life, and their projects. Interview 7 (Year 2) said: "Yes, I can relate the topic taught to my life. I can relate characters to myself, especially in the choices the character made when in conflict". Interview 2 (Year 2) said: "I apply the knowledge taught when I view films, where I analyse the film structure. Also, when I work on the edit for my project, I pay attention to story flow and I apply the build-up sequence to the end of the story". As for Year 1 interview respondents, 78% of them could relate or/and apply the knowledge taught to films, books, music videos, and topics taught in other classes.

The above encouraging results showed that most students in the flipped class were able to relate new ideas to previous knowledge to build an understanding of the material taught.

Other Findings

A significant in-class instruction method practiced in the flipped classes was peer learning to enhance students' learning experiences, engagement and to foster cooperative learning. Cooperation among students typically resulted in (a) higher achievement and greater productivity, (b) more caring, supportive, and committed relationships, and (c) greater psychological health, social competence, and self-esteem (Smith & Kampf, 2004). Among the respondents there was a common thread regarding the benefits of peer learning. 50% of the Year 2 interview respondents placed value on peer learning. Interview 10 (Year 2) said: "I feel more comfortable in small groups and this enables me to give opinions and ask questions. I find this way of learning effective". Interview 5 (Year 2) said: "Discussions with my peers are stimulating and I can retain the information better". Peer learning helped most of the students in this study to understand the topic better and engage in the learning process.

Another benefit from the in-class activities, based on the researcher's observation notes, was that the students developed soft skills, such as communication when they were in the small groups. They were seen facilitating the discussion, articulating ideas, encouraging one another to contribute to the discussion, helping one another to accomplish the task and practicing leadership skills. Interview 8 (Year 1) reinforced this observation, saying: "We learnt to communicate better, where we expressed our ideas and feelings and tried to be a good listener".

All the study respondents found the flipped classroom to be productive and useful for their learning: 37% of the interview respondents felt that it was because the online videos were accessible and could be viewed again when necessary; 26% of the respondents said that the knowledge they acquired was condensed into a short video and this saved time in their learning;

and 37% of the respondents said the flipped classrooms were productive for their learning as they were provoked to think about the topic before class and were able to go beyond what was taught.

Summary and Conclusion

The classroom flip in this study has shown encouraging results especially in the area of student participation in the lesson. The students have shown that they were involved in their own learning, with some students even applying what they learned in their own projects, and in their everyday lives. Students in this study also showed how they were able to connect new ideas to previous knowledge and apply it to the real world.

The flipped classroom is able to redesign a large lecture class into an active-learning class made of small groups. Despite a larger class size, active learning in small groups lead students to be engaged in learning, where they can participate, receive feedback and develop higher-order thinking skills. The class is no longer a place where students are passively seated and only take notes, but now is bustling with students who are interacting and discovering the lesson together.

In this study, exploratory learning through guided inquiry-based activities in the flipped classes was a successful way to engage students on a deeper level. This learning strategy increased the interaction between the teacher and the student and between the student and another student, despite the large class size. Interactive learning strategies in the classroom have to be planned out and revised accordingly as the dynamics is different from class to class, more so in a large class, so as to develop higher-order thinking skills and, ultimately, for students to become life-long learners.

The Flipped Classroom strategy promoted individualised learning for students as some of the students used the opportunity to replay and pause the online lecture to absorb it better. Students could do this at their own pace. However, students will need to take the initiative and take responsibility for their own learning.

Suggestions for further research include further development of the instructional design for flipped classrooms which includes blended learning with other active learning activities such as experiential learning and project-based learning to engage students in a meaningful and deeper level. One of the challenges for this research would be to cultivate student motivation and peer learning opportunities in order to achieve a common goal.

In carrying out this study, both learners and faculty members had a rewarding experience in using the flipped classroom model as it has empowered students to take charge of their learning and to be engaged in peer learning. It enabled the teachers to have one-on-one tutoring through a technology-infused lesson despite the large class size. This study provides an insight into a flipped classroom experience in a Malaysia context specifically in a Performing Arts course and supports the view that the flipped classroom has much to offer to the process of learning in higher educational institutions.

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ISSN: 2187-0594