



# Science Teachers' Perception on Multicultural Education Literacy and Curriculum Practices

Hsiu-Ping Huang

National Taitung University, TAIWAN

Ying-Yao Cheng

National Sun Yen-Sen University, TAIWAN

Cheng-Fu Yang

National University of Kaohsiung, TAIWAN

Received 30 September 2016 • Revised 11 November 2016 • Accepted 12 December 2016

## ABSTRACT

This study aimed to explore the current status of teachers' multicultural education literacy and multicultural curriculum practices, with a total of 274 elementary school science teachers from Taitung County as survey participants. The questionnaire used a Likert-type four-point scale which content included the teachers' perception of multicultural education literacy and their multicultural education curriculum practices. The primary findings were as follows: (1) Teachers' perception of multicultural education literacy reflected a highly positive and affirming attitude. (2) Teachers from various backgrounds did not demonstrate significant differences in their perception related to multicultural education literacy. (3) Teachers who graduated from junior teacher colleges, normal universities, or teacher colleges and those who teach natural sciences were more likely to place importance on multicultural concepts and practices in their curriculum. (4) Although teachers had a high level of perception related to multicultural education, there was still a gap in their ability to actually carry out multicultural teaching.

**Keywords:** science teacher, multicultural education, multicultural education literacy, curriculum practices

## INTRODUCTION

### Background of the Study

In recent years, multicultural education has gradually become a trend in many countries' educational systems. Boyd (2002) pointed out that multicultural education is highly important and school education should take matters of equality into account with regard to education. All students, regardless of their ethnic background, should receive the same learning opportunities so as to fulfill their latent potential. Kirshner (2002) believed that people of different ethnicities, sexual identities, religions, social classes, physical or mental disabilities,

© **Authors.** Terms and conditions of Creative Commons Attribution 4.0 International (CC BY 4.0) apply.

**Correspondence:** Hsiu-Ping Huang, *National Taitung University, Taiwan.*

✉ [hphuang3000@gmail.com](mailto:hphuang3000@gmail.com)

### **State of the literature**

- In terms of multicultural education, providing diverse learning opportunities and resources, moving beyond cultural differences, and going through the process of learning from one another will grant students the opportunity to understand each ethnic group's cultural connotations and move toward appreciation, tolerance, understanding, and respect for different ethnic groups.
- The connotations of teachers' multicultural literacy include the possession of multicultural knowledge and experience and the ability to perceive and comprehend multicultural differences and affirm their value.
- Teachers must also have a self-reflective attitude toward multiculturalism and possess the knowledge and skills necessary to develop a multicultural curriculum.

### **Contribution of this paper to the literature**

- There is a limited number of studies focus on science teachers' cognitions of multicultural education literacy in Taiwan. This study employed a quantitative method to investigate about the perception of science teachers' on multicultural education literacy and curriculum practices.
- Teachers should incorporate ethnic minority groups' life experiences and cognition into the design of science curricula and the learning environment in order to help ethnically diverse students better assimilate scientific knowledge.

and culturally deprived ethnic groups should be capable of understanding each other's culture and respecting one another.

Given rapid changes in Taiwan's demographic structure, students are becoming increasingly diverse in ethnicity and greater attention is gradually being devoted to multicultural education. The formulation of national policies and the encouragement of teachers to acquire multicultural education literacy demonstrate the importance placed on multicultural education. As the number of ethnically diverse students and children increases, considerable research in Taiwan has been focused on the educational issues related to indigenous students and new immigrants. For example, the current curriculum was designed to address the issue of poor scholastic performances of indigenous and new immigrant students in the sciences. Generally, curricula are primarily determined by the perspective of the majority ethnic group, barely taking into account the differences in cognition among ethnic minority groups. Furthermore, teachers themselves lack multicultural literacy and therefore adhere to stereotypes related to ethnic minority groups. Teachers' choices of teaching materials and teaching approach are such that the cultural cognition of different ethnic groups cannot be integrated, possibly leading to poor scholastic performance among ethnic minority groups.

School-aged children from ethnic minority groups, such as new immigrants or indigenous students, experience discrepancies between their life experiences and scientific cognition, leading to learning difficulties in scientific subjects. Teachers require a higher degree of multicultural literacy. Inclusion, teachers' teaching materials should be carefully

selected to keep pace with changes in the population structure and help students of different cultural backgrounds. Through their curriculum and teaching plan, as well as self-reflection regarding their own perspective on multicultural issues, teachers can affirm and respect the diverse culture of every ethnic group and promote tolerance and understanding in a multicultural classroom environment, which will certainly improve students' learning process.

### **Aim of the study**

The aims of this study were as follows: (1) To explore differences in perception of multicultural education literacy among teachers from various backgrounds. (2) Analysis of differences in curriculum practices related to multicultural education among teachers from various backgrounds.

## **LITERATURE REVIEW**

### **Definitions and Goals Related to Multicultural Education**

Grant and Ladson-Billings (1997) pointed out that multicultural education provides educational content according to students' various modes of thought and that this must be implemented in school and other educational institutions. Moreover, all curricula must adopt this concept of multiculturalism. Huang (2015) indicated the importance of multicultural education should be based on ethnic equality. The multicultural education is basic and universal, covering the course of school reform and important to all students (Nieto & Patty, 2007).

Bennett (1995) believed that multicultural education should treat students from all ethnic groups with fairness, particularly ethnic minority groups and children from impoverished backgrounds, in the hope of achieving equality in educational opportunities. Multiculturalism is a proactive approach to differences, affirming the value of the differences between each culture and allocating more resources to underprivileged cultural groups (Hung, 2005). Banks and Banks (2001) mentioned that, "the term multicultural education (now) describes a wide variety of programs and practices related to educational equality, women, ethnic groups, language minorities, low-income groups, and people with disabilities" ( p.6).

The goal of multicultural education is to provide equal educational opportunities and curricula that meet the needs of students. Additionally, it enables students to acknowledge the value of cultural diversity, respect the differences between ethnic groups, and cultivate harmonious relationship between ethnic groups (Davidman & Davidman, 1997; Gay, 1997). In summary, this research takes the promotion of equality of ethnic groups as the foundation for multicultural education.

## **Teachers' Multicultural Literacy and Related Research**

Teachers play a crucial role in multicultural education. The multicultural education literacy that teachers themselves possess has a significant impact on their implementation of multicultural education and students' ability to learn. Teachers' multicultural literacy includes their own cultural understanding and identity, their cognition and support of other cultures, and their bias- and stereotype-free cultural viewpoint (Tan, Liu, & You, 2010). Shan (1993) pointed out that teachers' multicultural literacy is an indication of their ability to elevate their own multicultural consciousness and cultural tolerance so as to increase their understanding of other cultures. Vavrus (2002) believed that teachers' multicultural literacy includes their overall perception of culture, ability to support diverse cultures, possession of the knowledge required to design multicultural curriculum, and ability to exercise democratic leadership in class management.

Banks (2003) pointed out that teachers should grasp concepts of differentiation, cultural and linguistic knowledge, diverse perception, and multicultural literacy in order to produce meta-frameworks for comprehensive curriculum. Chen (2000) indicated that teachers should possess multicultural literacy that includes an understanding of cultural diversity, the ability to continuously provide concern and care for students, the possession of field instruction skills, the ability to perceive the cultural needs of particular students, and experience with diverse cultures in order to provide guidance for students from different cultural backgrounds.

## **RESEARCH METHOD**

### **Sample**

This study aims to understand the current and relevant status of teachers' multicultural education literacy and multicultural curriculum practices, with a total of 274 primary school natural science teachers from Taitung County as survey participants.

### **Tools**

The questionnaire for this study, which is based on the goals of the study and a review of related documentation, was developed as a multicultural education literacy questionnaire for primary school natural science teachers. In addition to the teachers' basic information, the questionnaire content included the teachers' perception of multicultural education literacy and their multicultural education curriculum practices. The questionnaire used a Likert-type four-point scale. For the teachers' multicultural education literacy perception scale, the options were "strongly disagree," "disagree," "agree," and "strongly agree." For the teachers' multicultural education curriculum practices, the options were "never," "rarely," "regularly," and "always." The participants chose an option on the scale (valued from 1 to 4 points) that most closely matched their opinion. In the end, the points from each scale and the combined scales were calculated. The higher the score, the more advanced the teachers' perception

related to multicultural education literacy was and the stronger their skills related to multicultural curriculum practices were.

### Reliability

A total of 274 elementary science teachers from 91 schools were surveyed. Each was sent a questionnaire and 233 were returned, with a return rate of 85%. The school with the highest proportion of returned questionnaires was 100% (12 subjects), and that with the lowest proportion was 0% (1 subject).

Reliability was calculated using Cronbach's  $\alpha$ , estimating  $\alpha$  to be valued at .93 for the entire questionnaire. For the scales related to the teachers' multicultural education literacy and multicultural curriculum practices,  $\alpha$  was valued at .92 and .95, respectively, demonstrating a very high level of reliability. Through validity testing, taking a factor loading greater than .5 on the scale topics and deleting three items that did not fit the topics, the final questionnaire contained 42 items. An additional round of factor analysis was conducted for construct validity, requiring five dimensions: multicultural education as a concept, multicultural consciousness, multicultural awareness, curricular preparation and implementation, and the Kaiser-Meyer-Olkin (KMO) of the implementation of evaluation. All the dimensions were at the standard value of .60 and above, indicating suitability for conducting factor analysis. The proportions of validity explained by the five dimensions of the questionnaire were 69.50%, 81.94%, 75.52%, 68.99%, and 76.28%, respectively.

Because questionnaire items were deleted from the preliminary version of the questionnaire, another round of reliability analysis was performed. The final questionnaire included the following five dimensions: multicultural education concepts, multicultural consciousness, multicultural awareness, curriculum preparation and implementation, and the implementation of evaluation. For the overall scale,  $\alpha$  was valued at .91 and the scale was consistently very reliable.

## RESULTS AND DISCUSSION

This section will explain the results of the descriptive statistical analysis of the scale scoring on the questionnaire related to the teachers' multicultural perception and multicultural curriculum practices, presented with frequency, percentage, mean, and standard deviation (see [Table 1](#) and [Table 2](#)). Additionally, it will discuss differences in the viewpoints of the teachers from various backgrounds on multicultural perception and multicultural curriculum practices and address the teachers' various personal variables by conducting analysis of variance on variables including gender; age; academic degree; field of study; years of service; seniority as science teachers; ethnic background; whether or not they have experience teaching indigenous students, new immigrants, or students of other nationalities; the administrative district of the teachers' school; and whether or not they have attended multicultural workshops in the last three years.

Among these, three variables – gender; age; and whether or not they have experience teaching indigenous people, new immigrants, or students of other nationalities – were selected to be analyzed with an independent sample t-test. One-way analysis of variance was applied to the other seven background variables. If the value of F reached a level of significance ( $p < .05$ ), then additional post-comparison was conducted using Scheffé's method in order to understand differences between the groups, which are discussed as follows (see **Table 1** and **Table 2**):

### **Gender**

A total of 153 male teachers and 80 female teachers were included. The male and female teachers had an average score of 3.22 on the multicultural education literacy perception scale. Once the additional t-test was conducted, the two did not achieve a level of significance, showing that teachers of different genders do not demonstrate any differences in terms of multicultural concepts, diverse ethnic identity, or cultural differences.

In terms of scale averages for the teachers' multicultural education curriculum practices, male teachers had a score of 2.61, slightly higher than that of the female teachers (2.53). After the additional t-test was conducted, the two did not reach any level of significance ( $t = .163, p = .871 > .05$ ), and no significant difference ( $t = 1.204, p = .230 > .05$ ) was found in the multicultural curriculum practices of teachers of different genders.

### **Age**

A majority of the participants were in the 30–39 age range, and the participants in the 40–49 age range had the highest score (3.24) on the scale for perception. The 30–39 age range had the lowest score (3.20), but the average scores were quite close. Variance analysis revealed that they did not reach a level of significance ( $F = .067, p = .977 > .05$ ), demonstrating that teachers of different ages do not show an obvious discrepancy in their multicultural knowledge or perception.

Additionally, on the practices scale, the teachers above the age of 50 had the highest average scores (2.84), whereas those in the 40–49 age range had the lowest scores (2.53). Analysis of variance revealed that they did not reach a level of significance; thus, teachers of various ages did not show significant ( $F = 2.536, p = .058$ ) differences in their application of multicultural curricular design in the classroom.

**Table 1.** Results of multicultural education literacy scale

<b>Variables</b>	<b>M</b>	<b>SD</b>	<b>t/F</b>	<b>Sig.</b>
<b>Gender</b>			.163	.871
Men	3.22	.34		
Female	3.22	.29		
<b>Age</b>			.067	.977
Below 29	3.22	.32		
30-39	3.20	.32		
40-49	3.24	.31		
Above 50	3.23	.43		
<b>Academic degree</b>			.347	.707
Junior teacher college	3.08	.42		
Normal universities and teacher college	3.23	.33		
Teacher education programs (Postgraduate teacher education programs)	3.18	.30		
Graduate school and above	3.23	.34		
<b>Field of study</b>			.963	.411
natural sciences education departments (teacher junior college and normal college mathematics and sciences education departments)	3.31	.36		
natural sciences departments	3.22	.34		
social sciences and humanities departments	3.21	.32		
Others	3.21	.32		
<b>Years of service</b>			.327	.860
Below 5	3.20	.32		
6-10	3.20	.28		
11-15	3.24	.34		
16-20	3.19	.35		
Above 21	3.26	.33		
<b>Seniority as science teacher</b>			.261	.771
Below 5	3.23	.32		
6-10	3.20	.34		
11-15	3.23	.33		
16-20	3.26	.54		
Above 21	3.29	.33		
<b>Ethnical background</b>			.163	.183
Minnan	3.21	.32		
Hakka	3.25	.33		
Indigene	3.31	.32		
Mainland Chinese	3.11	.35		
Others	3.11	.35		

### Highest Academic Degree

A majority of the teachers were graduates of normal universities and teacher colleges, ranked as graduate school and above, followed by those who were not graduates of normal schools (having attended teacher education programs or postgraduate teacher education programs) and those who had attended junior teacher colleges. On the perception scale, the participants with degrees from normal universities or teacher training colleges had an average

score of 3.23, and the score of those who had attended graduate programs was the highest on average. Analysis of variance revealed that the score did not reach a level of significance ( $F = .347, p = .707 > .05$ ); therefore, the teachers with varying academic degrees did not show significant differences in multicultural education literacy perception. In other words, teachers' academic background does not tend to influence their multicultural literacy cognition, and teachers from different degree backgrounds do not have different understandings of multicultural education goals or attitudes toward multiculturalism.

On the practices scale, the teachers who had graduated from normal universities or teacher colleges had the highest score, 2.67. Additional analysis of variance (with junior teacher colleges, normal universities, and teacher colleges as a combined statistic) revealed that a level of significance was reached ( $F = 3.970, p = .02 < .05$ ), showing that teachers with varying academic degrees display differences in their multicultural curriculum practices. Scheffé's post-hoc test analysis indicated that the teachers whose highest academic degrees came from junior teacher colleges, normal universities, and teacher training colleges had a higher average score than those who had attended graduate school. This finding showed that those who taught natural sciences placed greater emphasis on multicultural concepts and practices in their curriculum.

### **Field of Study**

The teachers who graduated from the social sciences and humanities departments composed the highest number of participants, with the rest ranked as follows: natural sciences education departments (including teacher junior college mathematics and sciences and normal college mathematics and science education departments) and natural sciences departments. Those who graduated from natural sciences departments had an average score of 3.31 on the perception scale and 2.74 on the practices scale, the highest average scores on both scales. The study results reveal that the teachers who graduated from natural sciences education departments had the highest scores on both scales and those who graduated from the social sciences and humanities departments had lower scores, possibly because the teachers' scientific knowledge influenced their multicultural cognition and practices.

Analysis of variance showed that a level of significance was not reached ( $F = .963, p = .411 > .05$ ) regarding multicultural education literacy perception, demonstrating that teachers' field of study do not make a difference. There was no significant difference ( $F = 2.489, p = .061 > .05$ ) on the level of multicultural curriculum practices either.

**Table 2.** Results of multicultural curriculum practices scale

<b>Variables</b>	<b>M</b>	<b>SD</b>	<b>t/F</b>	<b>Sig.</b>
<b>Gender</b>			1.204	.230
Men	2.61	.46		
Female	2.53	.51		
<b>Age</b>			2.536	.058
Below 29	2.59	.49		
30-39	2.56	.43		
40-49	2.53	.48		
Above 50	2.84	.55		
<b>Academic degree</b>			3.970	.020*
Junior teacher college	2.31	.24		
Normal universities and teacher college	2.67	.47		
Teacher education programs (Postgraduate teacher education programs)	2.54	.44		
Graduate school and above	2.48	.48		
<b>Field of study</b>			2.489	.061
natural sciences education departments (teacher junior college and normal college mathematics and sciences education departments)	2.74	.52		
natural sciences departments	2.51	.42		
social sciences and humanities departments	2.60	.50		
Others	2.50	.43		
<b>Years of service</b>			1.885	.114
Below 5	2.57	.47		
6-10	2.61	.48		
11-15	2.60	.41		
16-20	2.42	.58		
Above 21	2.68	.44		
<b>Seniority as science teacher</b>			1.245	.290
Below 5	2.56	.49		
6-10	2.55	.45		
11-15	2.64	.54		
16-20	2.71	.47		
Above 21	3.03	.45		
<b>Ethnical background</b>			4.164	.007**
Minnan	2.53	.45		
Hakka	2.52	.57		
Indigene	2.82	.48		
Mainland Chinese	2.64	.51		
Others	2.64	.51		

**Table 2.** Results of multicultural curriculum practices (continued)

<b>Variables</b>	<b>M</b>	<b>SD</b>	<b>t/F</b>	<b>Sig.</b>
<b>Experience teaching indigenous students, new immigrants, or students of other nationalities</b>			3.623	.007**
yes	2.58	.48		
No	2.35	.92		
<b>School district</b>			.059	.981
Taitung municipal district	2.50	.48		
Rift valley district	2.62	.46		
Coastal district	2.59	.46		
NanHuei district	2.66	.53		
Islands district	2.73	.62		
<b>Times of attending workshop in the last three years</b>			3.263	.007**
None	2.41	.49		
Below 3	2.64	.45		
4-6	2.78	.53		
Above 7	2.81	.54		

\* $p < .05$  \*\* $p < .01$

### Years of Service

The majority of participants had served between 11 and 15 years, whereas the fewest number of participants were in the five years or less bracket. On the scales, those who had served 21 years or more scored 3.2 on perception and 2.68 on practices – the highest scores. Analysis of variance showed that a level of significance ( $F = .327, p = .860 > .05$ ) was not reached regarding multicultural education literacy perception, demonstrating that teachers' years of service do not make a difference. There was no significant difference ( $F = 1.885, p = .114 > .05$ ) on the level of multicultural curriculum practices either.

### Seniority as Science Teachers

Among science teachers, those with five years or less of experience were most common, whereas those with 21 years or more were the fewest in number. The teachers who had 21 years or more as science teachers had a score of 3.29 on the perception scale and 2.71 on the practices scale – the highest average scores. Variance analysis revealed that they did not reach a level of significance ( $F = .261, p = .771 > .05$ ), demonstrating that different seniority as science teachers do not show an obvious discrepancy in their multicultural knowledge or perception.

Additionally, on the practices scale, analysis of variance revealed that they did not reach a level of significance ( $F = 1.245, p = .290 > .05$ ); thus, teachers of various seniority as science

teachers did not show significant differences in their application of multicultural curricular design in the classroom.

### **Ethnic Background**

The majority of science teachers were from the Minnan ethnicity, followed by Indigene, Hakka, Mainland Chinese, and other ethnicities. In terms of average scores, the Mainland Chinese and other ethnicities were treated as a combined statistic, and the indigenous ethnic group had the highest score on the perception scale (3.31) and the practices scale (2.82). Variance analysis revealed that they did not reach a level of significance ( $F = .163, p = .183 > .05$ ), demonstrating that teachers of different ethnic background do not show an obvious discrepancy in their multicultural knowledge or perception.

Significant differences ( $F = 4.164, p = .007 < .01$ ) were perceived on the practices scale. Scheffé's post-hoc test indicated that average scores of the teachers from indigenous ethnic groups were higher than those of the Minnan teachers. The inferred reason was that indigenous teachers had an excellent understanding of their own ethnic group's culture and were better equipped to incorporate indigenous culture teaching materials in their curricula, interact with students of different ethnic backgrounds, and use multicultural evaluation methods.

### **Previous Experience Teaching Indigenous Student, New Immigrants, or Children of Other Nationalities**

There were 230 teachers with previous experience in teaching aborigines, new immigrants, or children of other nationalities and only two with no such previous experience. On the perception scale, the score for the teachers with such experience was 3.23 and that for the teachers without such experience was 2.91. After additional t-testing ( $t = .163, p = .183 > .05$ ) was conducted, it was observed that such experience did not have an influence on teachers' attitudes toward multicultural knowledge, beliefs, and respect for social diversity.

On the practices scale, the score for teachers who had taught indigenous people, new immigrants, or children of other nationalities was 2.58 and that for teachers who had not done so was 2.35. The results from t-test ( $t = 3.623, p = .007 < .01$ ) showed that whether or not teachers had such experience created a difference in their multicultural curricular design and evaluation. A possible reason for this could be that teachers with such experience had more opportunities for multicultural contact and had an easier time incorporating multicultural concepts in their curriculum practices. Alternatively, it could also be because of excessive disparity in the sample size, causing biased inferences from the statistical results.

### **School District**

The greatest number of participants, 82, came from Taitung Municipal District and the fewest, nine, from the Islands District. In terms of average scores, teachers from the Coastal District had the highest score for perception (3.28). For the practices scale, the highest score was for Islands District teachers (2.73). Analysis of variance showed that a level of significance ( $F = 1.304$ ,  $p = .274 > .05$ ) was not reached of multicultural education literacy perception, demonstrating that teachers from different school administration districts do not make a difference. There was no significant difference ( $F = .059$ ,  $p = .981 > .05$ ) on the level of multicultural curriculum practices either.

#### **Have attended a multicultural workshop in the last three years**

The majority had attended fewer than three workshops, and the smallest number had attended more than seven. The highest score on the perception scale was for the participants who had attended less than three workshops (3.26), and the highest score on the practices scale was for the teachers who had attended more than seven workshops (2.81).

Analysis of variance determined that a level of significance ( $F = 1.20$ ,  $p = .311 > .05$ ) was not reached in terms of perception, showing that the teachers who had attended different numbers of multicultural workshops were no different in their multicultural knowledge and concepts. Additionally, on the practices level, there was a significant difference ( $F = 3.263$ ,  $p = .007 < .01$ ). Scheffé's post-hoc test analysis further showed that the teachers who had attended three multicultural workshops had higher average scores for curriculum practices than those who had not attended any workshop. A possible reason for this could be that the teachers who attended workshops had more opportunities to be in contact with concepts related to multicultural curricular design, thereby implementing superior multicultural curriculum practices than the teachers who had never attended any workshop.

Overall, the statistical data showed that the participants with various background variables had perception scores between 2.91 and 3.31. From the standpoint of the Likert-style four-point scale, teachers' multicultural perception belied a highly positive and affirming attitude, most of teachers identified the importance of multicultural education. The statistical results showed that there was no significant difference among teachers' multicultural knowledge, multicultural education concepts, overall view of multicultural ethnic groups, respect for diversity, and self-bias and introspective consciousness.

Additionally, in terms of the practices scale, the average score was between 2.42 and 2.82, showing that teachers, in general, could actually employ multicultural concepts, but fewer teachers could put multicultural teaching strategies and evaluations into practice in their curricula. Statistical data showed that although teachers had a high level of cognition and perception related to multicultural education, there was still a gap in their ability to actually carry out multicultural teaching. This study's findings allow the inference that the teachers

reflected their ideals regarding multicultural literacy on the questionnaire but lacked actual skills related to multicultural literacy.

### CONCLUSION AND SUGGESTION

In multicultural education literacy scale, the statistical data showed that the participants with various background variables had perception scores between 2.91 and 3.31. From the standpoint of the Likert-style four-point scale, teachers' multicultural perception belied a highly positive and affirming attitude. The statistical results showed that teachers from various backgrounds did not demonstrate significant differences in their perception related to multicultural education literacy. Specifically, there was no significant difference among teachers' multicultural knowledge, multicultural education concepts, overall view of multicultural ethnic groups, respect for diversity, and self-bias and introspective consciousness.

Additionally, in terms of the multicultural education curriculum practices scale, the average score was between 2.42 and 2.82, showing that teachers, in general, could actually employ multicultural concepts, but fewer teachers could put multicultural teaching strategies and evaluations into practice in their curricula. Specifically, teachers who graduated from junior college-level normal schools, normal universities, or teacher training colleges and those who teach natural sciences are more likely to place importance on multicultural concepts and practices in their curricula. Indigenous teachers are familiar with their ethnic group's culture and can easily incorporate their ethnic culture into curricula. Teachers who have previously taught indigenous people, new immigrants, or children of other nationalities pay closer attention to multicultural education concepts in their classroom practices than those who have not had such experience. Teachers who have attended three multicultural workshops have an easier time disseminating their multicultural literacy in a classroom setting.

In conclusion, statistical data showed that although teachers had a high level of cognition and perception related to multicultural education, there was still a gap in their ability to actually carry out multicultural teaching. This study's findings allow the inference that the teachers reflected their ideals regarding multicultural literacy on the questionnaire but lacked actual skills related to multicultural literacy.

Based on the results, the following suggestions are proposed in this study with regard to enhancement of teachers' multicultural education literacy and curriculum practices in Taiwan: (1) Paying close attention to multicultural education training curricula and the planning of appropriate multicultural education curriculum will aid teachers in transforming their multicultural knowledge so that it can be put into practice in teaching. (2) Teachers should delve deeply into understanding the cultural experiences of students from other ethnic groups and seek to understand the life experiences of students from different ethnic backgrounds through interaction with community residents, school colleagues, and the students. This will help develop skills related to cultural tolerance and understanding in their

teaching practices. (3) To provide avenues for continuing multicultural education and assist teachers with their need for continuing education, administrative organizations can create more workshop opportunities, thereby enabling teachers to acquire additional multicultural knowledge and skills in a timely manner. This will help improve teachers' multicultural perception and practices.

### ACKNOWLEDGEMENTS

This study was granted by the Ministry of Science and Technology, Taiwan (formerly National Science Council-NSC 100-2511-S-143-003-MY2). The authors are grateful to the anonymous reviewers and the editor for their valuable comments and editorial assistance. Special thanks go to all participants.

### REFERENCES

- Banks, J. A. (2003). *Teaching strategies for ethnic studies* (7<sup>th</sup> ed.). Boston: Allyn & Bacon.
- Banks, J. A., & Banks, C. M. (Eds). (1995). *Multicultural education: Issues and perspectives* (4<sup>th</sup> ed). New York: Wiley.
- Bennett, C. I. (1995). *Comprehensive Multicultural Education: Theory and Practice*. Boston: Allyn and Bacon.
- Boyd, N. C. (2002). *Elementary school teacher's perception of Multicultural education*. Retrieved from <http://wwwlib.umi.com/dissertations>.
- Chen, M. J. (2000). *The Concept and Practices of Multicultural Curriculum*. Taipei: National Normal University Bookstore.
- Davidman, L., & Davidman, P. T. (1997). *Teaching with a multicultural perspective: A practical guide* (2<sup>nd</sup> ed.). New York: Longman.
- Gay, G. (1997). *Multicultural curriculum and instruction*. Paper presented at International Symposium on Multicultural Education. June, Taipei, Taiwan.
- Grant, C. A. & Ladson-Billings, G. (1997). *Dictionary of Multicultural Education*. Phoenix: Oryx Press.
- Huang, H. P. (2015). Study of aboriginal elementary school students' comprehension and learning motivations in mathematics courses based on multicultural education. *Journal of Physical Education, National Taitung University*, 23, 13-27.
- Hung, C. H. (2005). *The multicultural in Taiwan*. Taipei: Wunan.
- Kirshner, D. (2002). Untangling teachers' diverse aspirations for student learning: A cross disciplinary strategy for relating psychological theory to pedagogical practice. *Journal of Research in Mathematics Education*, 33(1), 46-58.
- Nieto, S. & Patty, B. (2007). *Affirming diversity: The sociopolitical context of multicultural education* (5<sup>th</sup> ed.). Boston: Allyn & Bacon.
- Shan, W. J. (1993). The strategy of creating a multicultural educational environment in the class. (pp. 427-457. In China Education Society (Ed.), *Multicultural education*: Taipei: Taiwan Book Company.
- Tan, G. D., Liu, M., & You, M. H. (2010). *Multicultural education 2<sup>nd</sup>*. Taipei: Higher Education Press.

Vavrus, M. (2002). *Transforming the multicultural education of teachers: Theory, research, and practice*. New York: Teachers Colleges Press.

**<http://iserjournals.com/journals/eurasia>**