

# TEACHERS' CONCEPTIONS OF COMPETENCY ASSESSMENT AND MODULAR CERTIFICATION (CAMC): ASSESSMENT OF THE MEASUREMENT MODEL

Lee Leh Hong  
Shahrir Jamaluddin, Ph.D  
University of Malaya  
[sharonllh@yahoo.com](mailto:sharonllh@yahoo.com)  
[jamaluddinshahrir@um.edu.my](mailto:jamaluddinshahrir@um.edu.my)

*Competency Assessment and Modular Certification (CAMC) was introduced in line with the introduction of 22 vocational subjects in secondary schools in Malaysia since 2002. Teachers' conceptions of CAMC were considered important as it was determined as one of the factors that may influence CAMC implementation. The purpose of this study was to test empirically using Structural Equation Modeling (SEM) approach the Confirmatory Factor Analysis (CFA) model of teachers' conceptions of CAMC. The teachers' conceptions of CAMC measured such dimensions as improve student learning, student accountability, and school accountability. Sample for the study were 205 teachers selected from schools offering the vocational subjects in Kuala Lumpur, Selangor, Melaka, Negeri Sembilan, and Perak. The instrument consisted of 11 items and the items were hypothesized a priori to have nonzero loadings on the three dimensions. Analysis of the 11 items resulted in a well-fitting model ( $\chi^2 = 72.38$ ;  $df = 41$ ;  $GFI = .941$ ;  $CFI = .939$ ;  $RMSEA = .061$ ). The final fitted measurement model was further validated.*

**Keywords:** Competency assessment, modular certification, measurement model

Teachers' conceptions of Competency Assessment and Modular Certification (CAMC) are considered important as one of the variables that may influence the implementation of CAMC. This variable is important because evidence exists that teachers' conceptions of assessment (i.e., CAMC) influence how strongly they teach, what students learn or achieve and how learning is evaluated (Brown, 2003; Calderhead, 1996). The implementation of any new assessment policy, tool or practice, whether at the national or local school level, needs to take into account the teachers' conceptions of assessment to ensure success.

According to Cohen and Hill (2000), teachers' beliefs will be influenced by manipulating elements of instructional policy in educational reform. This will then help to improve students' performances. Many studies also show that there are significant relationships between teachers' beliefs and their practices in educational reform (Basturkmen, Loewen, & Ellis, 2004; Tardy & Snyder, 2004; Yung, 2002).

Mander's (1997) study showed how teachers' personal and biographical factors, school's support, the role of principal and participation in decision making will shape teachers' practices. Educational reform and the use of new curriculum material and activities and quality control play a significant role in changing teachers' practices (Powell & Anderson, 2002). According to Powell and Anderson, in most educational reforms a substantial professional development effort such as training will be provided to teachers on usage of the new curriculum materials and activities. The role of professional development is considered important because adopting a new curriculum entails changes in practice for improving student learning and attitudes. There is a complex relationship between knowledge, practices and beliefs. Guskey (1986) found that professional development activities were most effective at changing beliefs when teachers could be helped to adopt a new practice and argued that changes in belief follow changes in practice.

Kahn (2000) pointed out that teachers appeared to assimilate new assessment practices into long-standing transmission, teacher-oriented, accountability type assessment and learning frameworks. Certainly the implementation of new standards from professional bodies or state authorities, while well intentioned, may be less effective if teachers' conceptions of CAMC remain unchanged or unchallenged, or if teachers remain unaware of their own conceptions (Brown, 2003). Thus, teachers who are aware of their conceptions of CAMC are hypothesized to have greater influence in implementing it.



According to Shepard (2000), any attempt to change the form and purpose of classroom assessment to make it more fundamentally a part of the learning process must acknowledge the power of enduring and hidden beliefs. She suggested that dissonance between instruction and assessment arises because of the misfit between old views of testing and a transformed vision of teaching. However, even reformed versions of instruction have only begun to be implemented. As many studies of teacher change and attempted educational reform have documented, all three parts of the old paradigm (i.e., social efficiency, behaviorism and scientific measurement) continue to provide a mutually reinforcing set of ideas that shape current thinking and practices (Shepard, 2000).

Clearly, the abilities needed to implement a reformed vision of curriculum and assessment are challenging. Cremin's (1961, in Shepard, 2000) earlier observation stated that progressive education requires "infinitely skilled teachers". Being able to ask the right questions at the right time, anticipate conceptual pitfalls and have a repertoire of tasks that will help students take the next steps requires deep knowledge of subject matter. Teachers will also need help in learning to use assessment in new ways. According to Shepard (2000), given that new ideas about the role of assessment are likely to challenge prevailing beliefs, teachers will need assistance to reflect on their own beliefs as well as those of students, colleagues and school administrators. This is because teachers' beliefs, knowledge and skills are important in changing assessment practices.

### **Teachers' Conceptions of Assessment**

Researchers have suggested that assessment serves at least three major purposes: improving teaching and learning, certifying students' learning and ensuring accountability of schools and teachers (Heaton, 1975; Torrance & Pryor, 1998; Warren & Nisbet, 1999; Webb, 1992). These purposes can lead to different practices and often create tensions between the purposes. Assessment is understood as any act of interpreting information about student performance, collected through any of a multitude of means or practices. According to Gipps, Brown, McCallum, and McAlister (1995), assessment is a general term embracing all methods customarily used to appraise individual or group performance. It may refer to a broad appraisal including many sources of evidence and many aspects of a pupil's knowledge, understanding, skills and attitudes; or to a particular occasion or instrument. They further suggest that an assessment instrument may be any method or procedure, formal or informal, for producing information about pupils, for example a written test paper, an interview, or a measurement task using equipment or a class quiz.

The quality of information obtained through assessment can affect the quality of educational decisions (Cronbach, 1970); the quality of data obtained can be evaluated through the collection of validation and reliability evidence. The quality of assessment information includes awareness of any limitations of assessment information, which includes the degree of inaccuracy in any measure or any unfair consequences for students (Cronbach, 1970; Hall, 2000; Linn, 2000; Popham, 2000). Unfortunately, many teacher-made or classroom assessments and intuitive judgments lack such quality indicators (McMillan, 2004).

Some models of teachers' conceptions of assessment have been developed based on teachers' assessment practices or uses (Brown, 2004a; Gipps et al., 1995; Stamp, 1987). These models, based on types of assessment practices, relate to the model outlines in this subsection. Brown (2004a) states that four major conceptions of assessment are held by teachers, namely: (a) assessment is useful in improving teacher instruction and student learning by providing quality information for decision making; (b) assessment is about accountability of students through certification processes; (c) teachers or schools are made accountable through internal or external evaluations; and (d) assessment is irrelevant or pernicious to the work of teachers and the life of students.

The Gipps et al. (1995) model classified teachers by three major types of assessment such as intuitive, evidence gatherers, and systematic planners. Intuitive emphasized professional, impressionistic, memory-reliant judgment processes of assessing students' performances intuitively without written records. Evidence gatherers collected written evidence, usually at the end of the work, to demonstrate students' progress relative to achievement objectives for accountability. Systematic planners integrate systematic collection of multiple pieces of evidence of attainment of curriculum objectives with planned teaching for the purpose of shaping instruction.



Stamp's (1987) model, developed with multivariate techniques, identified three major conceptions of assessment among pre-service teacher trainees in Australia. They are cater for the need and progress of individual pupils, assessment blocks teacher's initiative, and a more traditional-academic summative examination. The first conception used assessment in a formative way to identify individual student learning needs to catering for those individual requirements. The second conception reflected the view that teachers are required to conduct assessment but that assessment gets in the way of students' creativity and intuition, which are just as important as their academic development. The third conception revolved around the use of tests and examinations to collect summative information about students partly in order to motivate them to compete for more marks.

The three models of teachers' assessment practices outlined above suggest that teachers' practices fall mainly into one category. No evidence could be found for the relationship of practices to conceptions of assessment, for any interaction of the practices or whether teachers mixed the conceptions in their practices. However, it is expected that teachers' conceptions of assessment interact with each other (Brown, 2004a). The nature of teachers' conceptions of assessment is unknown and it is unknown whether certain characteristics of teachers or schools influence teachers' conceptions of assessment. For example, the kinds of assessment methods teachers associate with the term 'assessment' may influence teachers to different assessment conceptions. The kinds of assessment methods teachers actually use and the length and type of assessment literacy training may also correlate with certain assessment conceptions. A teacher's role in a school, his or her length of experience, or gender may also influence the conception of assessment held. To address this concern, therefore, it is essential to develop a clear understanding about teachers' conceptions of CAMC.

The present study is aimed at testing empirically using Structural Equation Modeling (SEM) approach the Confirmatory Factor Analysis (CFA) model of teachers' conceptions of CAMC. The teachers' conceptions of CAMC is hypothesized to be measured by three dimensions such as improved student learning, student accountability, and school accountability. Accordingly, this study served as a foundation for developing a rating scale that would produce valid and reliable scores to assess teachers' conceptions of CAMC. Specifically, the study empirically tested the probability of the three common-factor structure of teachers' conceptions of CAMC.

## **Methodology**

### ***Instrument***

A pool of 11 statements was developed for this study. The teachers were required to indicate their beliefs and conceptions of the school-based assessment of CAMC on a five-point response scale (Strongly Disagree, Disagree, Not Sure, Agree and Strongly Agree). Each statement was worded to capture the meaning attached to one of the three dimensions. Theoretically, the latent factor for the five statements (i.e., 3, 4, 5, 7, and 9) was improved student learning, the subsequent six statements assessed the student accountability and school accountability.

### ***Sample***

A total of 205 teachers from 110 secondary schools offering the vocational subjects in Kuala Lumpur, Selangor, Melaka, Negeri Sembilan, and Perak were purposively selected for the study. The respondents were trained to assess CAMC in Form 4 and Form 5 students. Each respondent specialized in teaching of one of the 22 vocational subjects offered. The questionnaires were sent by post to all the selected schools and stamped addressed return envelopes were enclosed to encourage responses. A cover letter by the Malaysian Examination Syndicate (MES) outlining the importance of this study was attached. The questionnaires were then self-administered and teachers were given fourteen days to return it to the researcher. This was conducted to determine the reliability and validity or CFA of the instrument.

To further validate the well-fitted measurement model a total of 158 teachers from secondary schools offering the vocational subjects in Pahang, Kelantan and Terengganu were purposively selected for this study. The same data collection procedures were employed.

**Data Analysis**

To arrive at the conclusion, a confirmatory factor analysis (CFA) was conducted on the hypothesized three-factor structure model using Analysis of Moment Structure (AMOS) version 7. Assessment of the measurement model involved confirmatory factor analysis (CFA) (Hoyle, 1995). CFA assessed the reliability and validity of the individual items and the overall measurement model. The program adopted maximum likelihood estimation to generate estimates in the measurement model.

To assess for the reliability of the instrument in this study the researcher made use of estimates of internal consistency (Cronbach’s alpha). Cronbach’s alpha is a commonly used measure testing the extent to which multiple indicators for a latent variable belong together. A general rule is that the indicators should have a Cronbach’s alpha of .7 or more. Further confirmation of the overall fit of the measurement model using CFA is obtained from the Maximum Likelihood estimation Chi-square ( $\chi^2$ ) statistics produced by AMOS and various other goodness-of-fit criteria. Byrne (2001) suggested the goodness of fit indexes are the chi-square ( $\chi^2$ ), smaller chi square the better and *p* value greater than .05, Goodness of Fit Index (GFI) and Comparative Fit Index (CFI) are greater than .90 and the absolute fit of the model, Root Mean Square Error of Approximation (RMSEA) is below .08. Subsequently the final fitted measurement model was further validated.

**Results**

The validity and reliability of the instrument reported here are based on the data collected from this study. The strategy employed in the present study to test the validity and the reliability of the instrument focuses on the psychometric properties of the scales used. In this aspect the researcher made use of estimates of internal consistency (Cronbach’s alpha) and confirmatory factor analysis (CFA).

Table 1 shows the internal consistency (Cronbach’s alpha), Table 2 shows the regression weights of the model and Table 3 shows the goodness of fit indexes of confirmatory factor analysis (CFA) for the measurement model of teachers’ conceptions of CAMC.

Table 1  
*Internal Consistency of the Instrument (Cronbach’s alpha)*

Instrument	Cronbach’s alpha value
Improved Student Learning	.747
Student Accountability	.700
School Accountability	.835
Total instrument	.857



Table 2  
Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P
C03	<---	IMPROVED_STUDENT_LEARNING	1.000			
C04	<---	IMPROVED_STUDENT_LEARNING	.839	.136	6.165	***
C05	<---	IMPROVED_STUDENT_LEARNING	1.327	.188	7.073	***
C07	<---	IMPROVED_STUDENT_LEARNING	.977	.146	6.680	***
C09	<---	IMPROVED_STUDENT_LEARNING	.942	.136	6.920	***
C08	<---	STUDENT_ACCOUNTABILITY	1.000			
C10	<---	STUDENT_ACCOUNTABILITY	2.523	.501	5.035	***
C11	<---	STUDENT_ACCOUNTABILITY	1.889	.349	5.415	***
C01	<---	SCHOOL_ACCOUNTABILITY	1.000			
C02	<---	SCHOOL_ACCOUNTABILITY	.665	.116	5.710	***
C06	<---	SCHOOL_ACCOUNTABILITY	1.106	.184	6.021	***

Table 3  
Measures of Goodness of Fit for the Measurement Model

Latent Variables	$\chi^2$	df	p	GFI	CFI	RMSEA
Teachers' Conceptions of CAMC (n1 = 205)	72.38	41	.002	.941	.939	.061
Teachers' Conceptions of CAMC (cross validation model) (n2 = 152)	66.68	41	.007	.928	.940	.064

Discussion

The Hypothesized Model

Figure 1 presents the estimated three-factor model for teachers' conceptions of CAMC, using the data from 205 teachers. Items from each scale are assumed to load only on their respective latent variables. The overall fit of the 11-item measurement model is summarized in Figure 1. The goodness-of-fit results indicate the hypothesised model is consistent with the data.

All the 11 items have non-zero loadings to the three factors. Refer Table 2 for the maximum likelihood estimation. All the items loaded significantly to the three factors. The direction and magnitude of the factor loadings were substantial and statistically significant. The model is free from offending estimates and the internal consistency estimates satisfied the standard deemed necessary in scale construction.

The result of this analysis is presented in Table 3. Analysis of the 11 items resulted in a well-fitting model ( $\chi^2 = 72.38$ ;  $df = 41$ ;  $GFI = .941$ ;  $CFI = .939$ ;  $RMSEA = .061$ ). The ratio of the chi-square to its corresponding degrees of freedom ( $\chi^2/df = 1.76$ ) also called relative chi square was acceptable. Kline (2005) says 3 or less is acceptable. Some researchers allow values as high as 5 to consider a model as having adequate fit, while others insist relative chi square be 2 or less. Both the fit indicators, the GFI and CFI exceeded the threshold of .90, the standard deemed important for model

fit. Furthermore, the root mean square error of approximation (RMSEA = .061) indicated a well fitted hypothesised model.

To further validate the likelihood of the hypothesized model, a second confirmatory factor analysis was applied on the data collected from 152 teachers from Pahang, Kelantan and Terengganu. The results of this analysis are presented in Table 3. The validation model shows a well-fitting model ( $\chi^2 = 66.68$ ;  $df = 41$ ; GFI = .928; CFI = .940; RMSEA = .064). The ratio of the chi-square to its corresponding degrees of freedom ( $\chi^2/df = 1.63$ ) was acceptable.

Chi-square=72.375  
 df=41, p=.002  
 GFI=.941  
 CFI=.939  
 RMSEA=.061

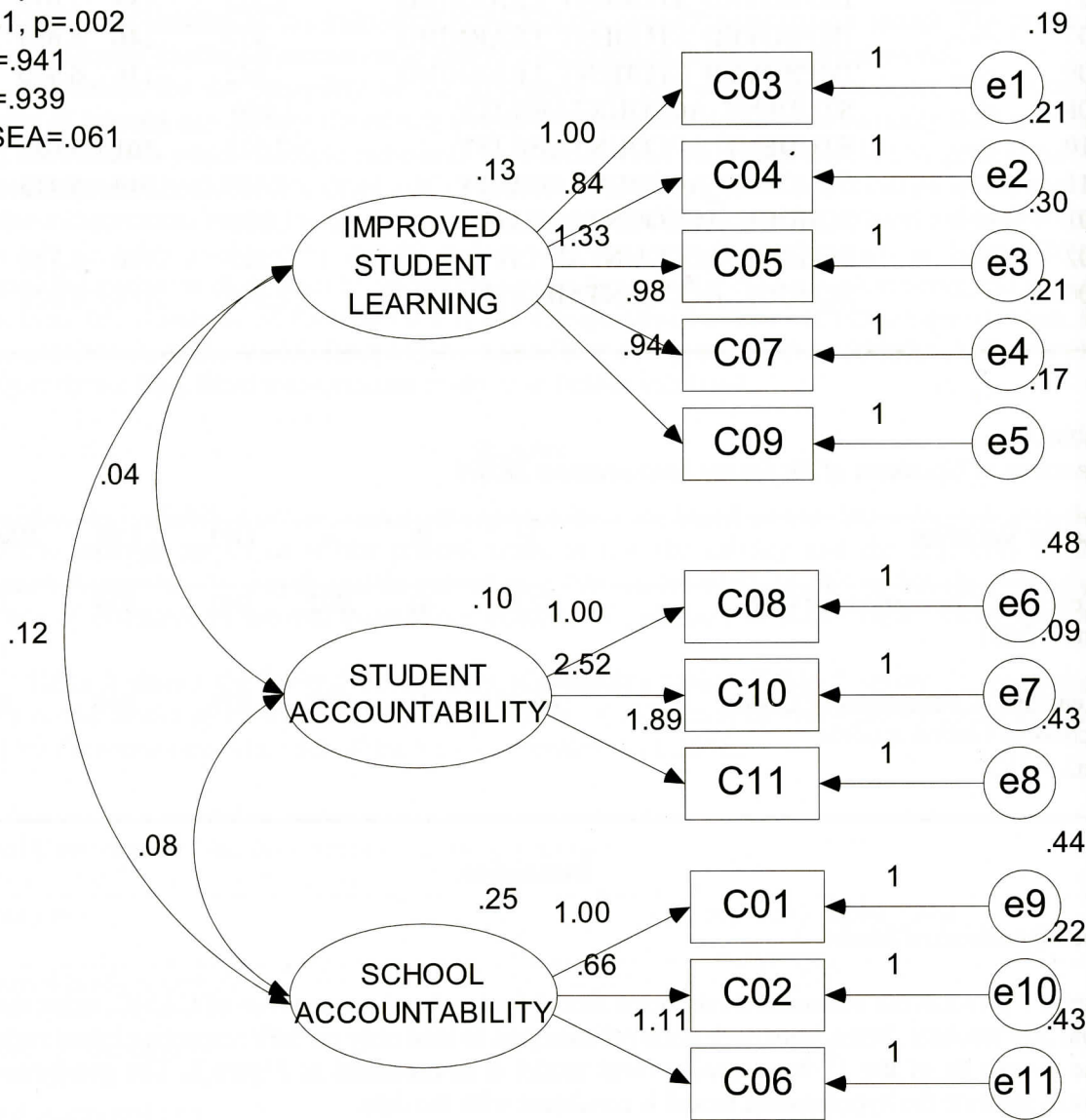


Figure 1. Teachers' Conceptions of CAMC: The hypothesized model (C01-C11 represent observed variables; e1-e11 represent error variances; double-headed arrows depict correlations among factors; single headed arrows from factors depict factor loadings)

## Conclusion

This study contributes to the development of a psychometrically sound instrument to assess teachers' conceptions of CAMC. The results of the confirmatory factor analysis support the assertion that the conception is a multidimensional construct, the dimensions being improved student learning, student accountability and school accountability. This finding supports previous studies of teachers' conceptions of assessment which, however, had examined teachers' knowledge of and attitudes toward assessment (Gipps et al., 1995; Heaton, 1975; Torrance & Pryor, 1998; Warren & Nisbet, 1999; Webb, 1992).

This study has implications for educational practice, especially in assessing teachers' conceptions of CAMC. Since the 11-item three-factor structure yields a valid and reliable measurement model, the conception scale is therefore useful in conducting diagnostic assessment of teachers' conceptions of CAMC. Result of assessment would enable the policy makers to design and implement programs that could shape teachers' conceptions toward CAMC.

## References

- Basturkmen, H., Loewen, S., & Ellis, R. (2004). Teachers' stated beliefs about incidental focus on form and their classroom practices. *Applied Linguistics*, 25(2), 243.
- Brown, G. T. L. (2003, December). Teachers' Instructional Conceptions: Assessment's relationship to Learning, Curriculum and Teacher Efficacy. Paper presented at the Joint Conference of the Australian and New Zealand Association for Research in Education (AARE/NZARE), Auckland.
- Brown, G. T. L. (2004a). Teachers' conceptions of assessment: Implications for policy and professional development. *Assessment in Education: Policy, Principles and Practice*, 11, 305-322.
- Byrne, B. M. (2001). *Structural Equation Modeling with AMOS: Basic concepts, applications, and programming*. Mahwah, NJ: Erlbaum.
- Calderhead, J. (1996). Teachers: Beliefs and knowledge. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology* (pp. 709-725). New York: Macmillan.
- Cohen, D. K., & Hill, H. C. (2000). Instructional policy and classroom performance: The mathematics reform in California. *Teachers College Record*, 102(2), 294.
- Cronbach, L. J. (1970). *Essentials of psychology testing* (3rd ed.). New York: Harper.
- Gipps, C., Brown, M., McCallum, B., & McAlister, S. (1995). *Intuition or evidence? Teachers and national assessment of seven-year-olds*. Buckingham, UK: Open University Press.
- Guskey, T. R. (1986). Staff development and process of teacher change. *Educational Researcher*, 15(5), 5-12.
- Hall, C. (2000). National certificate of educational achievement: Issues of reliability, validity and manageability. *New Zealand Annual Review of Education*, 9, 173-196.
- Heaton, J. B. (1975). *Writing English language tests*. London: Longman.



- Hoyle, R. H. (1995). The structural equation modeling approach: Basic concepts and fundamental issues. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues and applications* (pp. 1-15). Thousand Oaks, CA: Sage.
- Kahn, E. A. (2000). A case study of assessment in grade 10 English course. *The Journal of Educational Research*, 93(5), 276-289.
- Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed.). New York: Guilford Press.
- Linn, R. L. (2000). Assessment and accountability. *Educational Researcher*, 29(2), 4-16.
- Mander, A. (1997). Teachers' work: Some complex interactions between teachers and their schools. *Asia-Pacific Journal of Teacher Education*, 25(3), 281-194.
- McAllister, G., & Irvine, J. J. (2002). The role of empathy in teaching culturally diverse students: A qualitative study of teachers' beliefs. *Journal of Teacher Education*, 53(5), 433.
- McMillan, F. H. (2004). *Classroom assessment: Principles and practice for effective instruction* (3rd ed.). Boston: Pearson.
- Popham, W. J. (2000). *Modern educational measurement: Practical guidelines for educational leaders* (3rd ed.). Boston: Allyn & Bacon.
- Powell, J. C., & Anderson, R. D. (2002). Changing teachers' practice: Curriculum materials and science education reform in the USA. *Studies in Science Education*, 37, 107-138.
- Shepard, L. A. (2000). *The role of classroom assessment in teaching and learning* (No. CSE Technical Report 517). Boulder: CRESST/University of Colorado.
- Stamp, D. (1987). Evaluation of the formation and stability of student teacher attitudes to measurement and evaluation practices. Unpublished doctoral dissertation, Macquarie University, Sydney, Australia.
- Tardy, C. M., & Snyder, B. (2004). 'That's why I do it': Flow and EFL teachers' practices. *ELT Journal*, 58(2), 118.
- Torrance, H., & Pryor, J. (1998). *Investigating formative assessment: Teaching, learning and assessment in the classroom*. Buckingham, UK: Open University Press.
- Warren, E., & Nisbet, S. (1999). *The relationship between the purported use of assessment techniques and beliefs about the uses of assessment*. Paper presented at the 22<sup>nd</sup> Annual Conference of the Mathematics Education and Research Group of Australasia, Adelaide, SA.
- Webb, N. L. (1992). Assessment of students' knowledge of mathematics: Steps toward a theory. In D. A. Grouws (Ed.), *Handbook of research on mathematics teaching and learning*. (pp. 661-683). New York: Macmillan.
- Yung, B. H-W. (2002). Same assessment, different practice: Professional consciousness as a determinant of teachers' practice in a school-based assessment scheme. *Assessment in education*, 9(1), 97.