

Development of an assessment system in mathematics instruction for seventh grade students

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Abstract : This research employed the research and development methodology and the major objective of this study was to develop of an assessment system in mathematics instruction for seventh grade students. There were three major purposes namely, the development of the system, try out and the evaluation of the system. The research sample consisted of 4 math teachers and 249 students, The research comparison group consisted of 6 math teacher and 285 students. The data collection includes documentary research, interview, classroom observation and testing. The analysis of the obtained data is performed quantitatively via descriptive statistics and qualitatively via content analysis.

The research finding are as follows:

1. The assessment system in mathematics instruction comprises 3 principal components, namely 1) curriculum development system : CDS 2) the instructional and assessment system (Understanding by design: UbD) 3) assessment for learning.

2. The try out of the evaluating reveals that teachers of sampled can put this system into practical use assessment for learning and provide favorable feedback on mathematics instruction to develop their students as well as their own implementation. Hence, these student achieve substantial progress in the system-yielded results, thereby creating their teacher's good desired outgrowths upon the operated program

3. The evaluation of the launched scheme shows that all the participants are satisfied with it, sharing an opinion in that the generated system contains utility, feasibility, propriety and accuracy. Furthermore, system users were satisfied with this methodology.

Key words : assessment system , assessment for learning, classroom assessment , alternative assessment , SOLO taxonomy

Introduction

In Thailand , Ministry of Education (MOE) have National Curriculum : Basic Education. In 2009 MOE reform curriculum from "Basic Education Curriculum B.E.2544 (2001)" to "Basic Education Core Curriculum B.E.2551 (2009).Mathematics is core subject in Basic Education. Current basic education curriculum B.E.2544 (2001) (Board. The National Primary Education. 2544: 24-25). Role of assessment activities as part of the learning process. Is a direct function of teaching all do a assessment of all learning. To verify the ability to learn. And while a check on teaching effectiveness of instructors. Assessment is an integral part of instruction providing information pertaining on a student's progression toward standards. Standards, curriculum instruction and assessment are interwoven in the learning process. Current assessment practices for both learners and teachers. A process used by teachers and students during instruction that provides feedback to adjust ongoing teaching and learning to help students improve their achievement of intended instructional outcomes.

Results from the Seminar on Evaluation of Learning reform basic education by The National Education Act 2542.With suggestions for policy-oriented assessment. To accelerate the development of teachers. Ability of assessment for learning consistent with the learning process. The study because of the discovery is important. Has changed the way teachers teach but the assessment was a highlight. Content, consistent with the data from the inspection visit of the school board evaluate the reform. Learn the basic education level. The data from the students. Changing the way teachers teach to the test. Use the same tests. Reflecting the need for teachers to develop understanding of concepts. About assessment should be systematically developed and new assessment approach Classes to the system. (Office of the Education Council :ONEC 2004).

Current assessment practices tend to focus on Assessment of learning. Such 'testing' generally is summative, and drives the teaching (teaching for the test). It is also inauthentic, context independent, inflexible and uneconomical. Assessment for learning is generally formative, integrated into the curriculum, authentic, context embedded and flexible. Key principles included that the learners participate in the assessment process and assessment is contextual and responsive. Why

current assessment systems in school fail learners and teachers. Current assessment practices for both learners and teachers. Current assessments focus on assessment of learning rather than assessment for learning. They are limited in scope, and lead to teaching for assessment, NOT teaching for learning. These key factors contribute to the failure and/or rejection of a range of learners within the current education systems across Thailand. Today's knowledge and information society requires learners to become problem solvers and creative thinkers in all subjects and areas. This premise also includes the development of learning skills that become 'learning for life's skills. Problem solving and creative thinking are generally not required by current assessment practices in Thailand

Most of math teachers are lack of knowledge , method, tool , and management about assessment (misconception): assessment tool use only test and are not authentic assessment . Not Reflect standard based curriculum. (Research report : ONEC).Recommendation policy about assessment must to the development of teacher ability. The teacher change teaching method but assessment focused on traditional content by using. used paper and pencil.

Both PISA and TIMSS point at the need for educational reforms in a range of Thailand. These educational reforms may be more wide ranging than focusing on assessment, but re-thinking assessment forms part of a larger drive to effect change across the curriculum. Curriculum and learning development in mathematics fail to build up leaders in these fields. This necessitates the improvement of teaching and learning procedures in order to build up skills, creativity, and the right attitude among Thai people. Results from the measure. Need to improve teaching and learning mathematics to become more efficient. Due to the international evaluation. Thailand is ranked relatively low compared with many countries, particularly countries in Asia should be together to study ways to develop children's mathematical ability. Thailand also need to consider the development of education in mathematics again. Moreover math skills in the development of urgently needed is a process of learning math skills.

Background

Assessment is a central part of teaching (Lin , 1990) with the majority of teachers using it to gauge student's knowledge , understanding and skills at a particular time in a learning sequence (Stiggins , 2002). Alternative assessment is needed in classroom practice , there are mainly three related reason. The first in that the traditional paper and pencil test has its own limitation. The second is that new educational goals and values have been developed over the last decades. The third is a reflection of the development of the new conception of pedagogy and assessment. The newer and concept of assessment in mathematics education goes much beyond adjust being written test only in how students are assessed , but also in what and why they are assessed. Assessment in the alternative paradigm is seen, in fact, as a process almost wholly integrated with teaching and learning (Torrance, 1995).The fact that the phrase 'assessment for learning' has come to refer to 'any assessment for which the first priority is to serve the purpose of promoting student's learning' (Black et al., 2003, p.2) The new paradigm calls in fact for classroom assessment to be seen as the gathering of information by both the teacher and students about their teaching-learning situation in order to help them in their decisions.

Changes to these traditional assessment methods have been a world-wide focus over the last decade (Morgan & Watson, 2002) with the work by Black and Wiliam (1998) introducing the notion of assessment for learning in contrast to the prevailing assessment of learning perspective. In their view, assessment must move away from the summative regime identified above, based around the collection of marks for accountability and reporting purposes to one that is integrated into the teaching and learning process. Biggs (1996) referred to this idea as 'constructive alignment' with curriculum, pedagogy and assessment linked to ensure that each component is used to inform the direction of teaching and so enhance student learning. A critical element in this approach is the importance of ongoing or formative assessment to monitor on a day-to-day basis where students are and where their learning needs to be directed (Bell & Cowie, 2001; Hattie & Timperley, 2007; Pelegrino, Chudowsky, & Glaser, 2001; Shepard, 2000). Teachers need to blur the distinction between assessment and instruction.

According to the UK Assessment Reform Group (1999) identifies the big 5 principles of assessment for learning : 1) The provision of effective feedback to students. 2) The active involvement of students in their own learning. 3) Adjusting teaching to take account of the results of

assessment. 4) Recognition of the profound influence assessment has on the motivation and self esteem of pupils, both of which are critical influences on learning. 5) The need for students to be able to assess themselves and understand how to improve.

Two educational taxonomies dominate the literature , namely : Bloom’s taxonomy and Biggs’s SOLO taxonomy. The Cognitive process dimension contain six categories : remember , understanding , apply, analyse , evaluate and create. The knowledge dimension contains four categories : factual , conceptual , procedural and metacognitive (Anderson & krathwohl,2001 : 5) The Structure of the Observed Learning Outcome (SOLO) (Biggs & Collis ,1982 ,1991). SOLO was developed to focus on the structure of students’ responses after a learning experience. have 5 levels. of responses In the pre-structural stage , unstructured , multi structural , relational and extended abstract. The SOLO taxonomy addresses knowledge levels and does not include the cognitive levels as the Bloom taxonomy. Conceptual framework : Figure 1

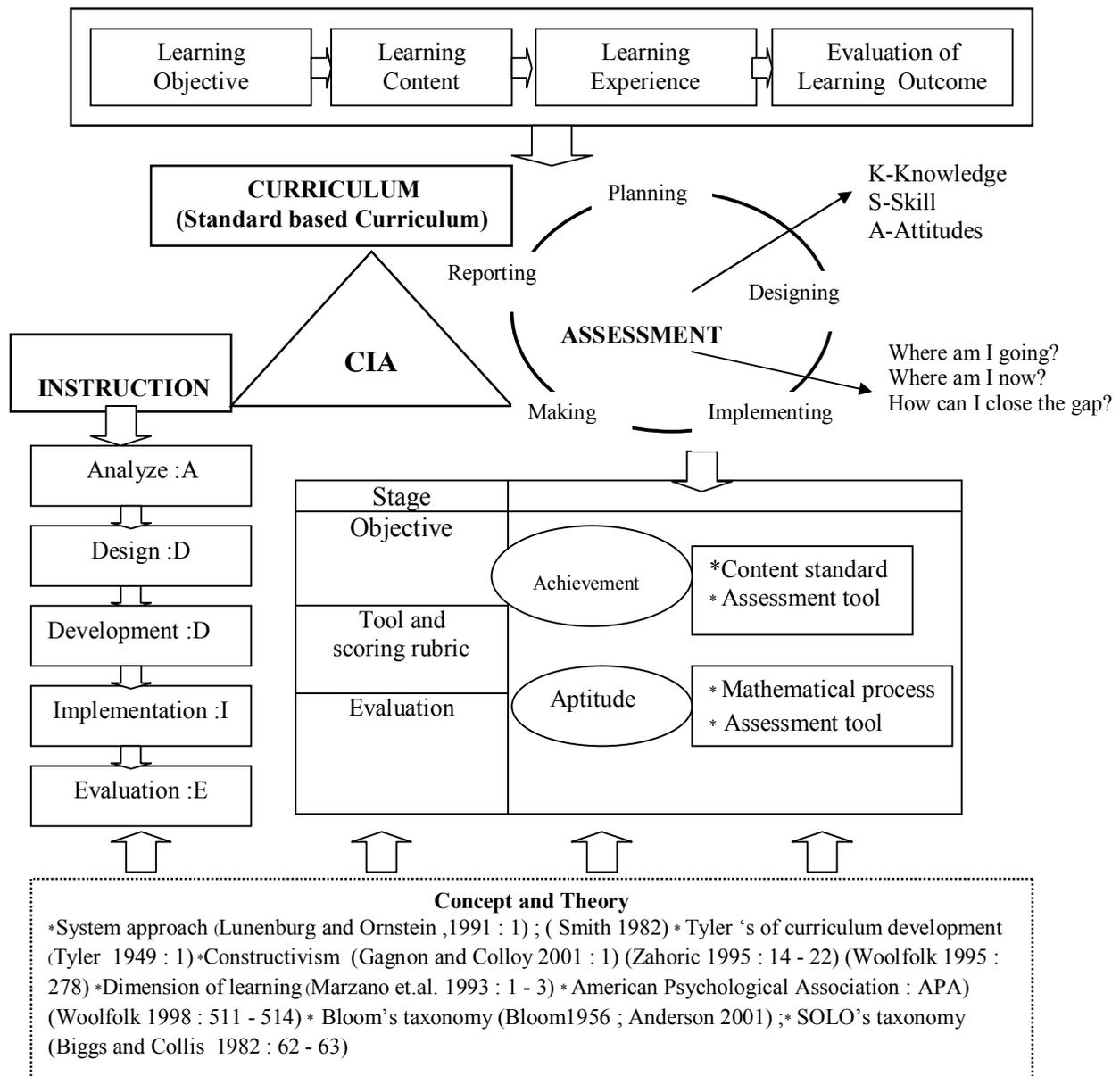


Figure 1: Conceptual Framework

Methods

The following research questions :

1. What is elements of an assessment system in mathematics instruction ?
2. The an assessment system in mathematics instruction that was developed to help teachers develop the knowledge, skills and opinion about evaluating teaching and learning level. And it can change student's learning behavior , mathematical skills and processes and desirable characteristics.
3. How to quality an assessment system in mathematics instruction effectively ?

This study is classify as a mixed methods case study design. The study will use both qualitative and quantitative methods of data collection including classroom observation , in-depth interview , document analysis. The decision of using both qualitative and quantitative methods of data collection is because their appropriateness for examine different facts of the phenomena under study , for triangulation and for adding breath and depth to the examination of the issue studies.

The research of Yin and Stake support case study methodology. In this study the researcher provide a rich and thick description of the classroom events, as the student engaged in actions and interactions during in the classroom (Merriam ,1988)

Robert Stake's approach to case study was used given its compatibility with the research orientation and the researcher's familiarity with this type of case study methodology (Stake :1995). This classroom observation focus on the teacher's teaching and learning assessment

Case study methodology

Methodology	Data Sources	Data Collection
Classroom Observations	4 math teachers	Transcripts field notes
In-depth interview	*math teacher *student *stakeholder : parent , principle, supervisor *expert in math teaching evaluation	Transcripts/ field notes/ participants
Professional Development	*Case study participants *Classroom teacher	Notes, field notes
Document analysis	Teacher document	Research log/ Lesson plan
	Student document	Work and/ or field notes/ task / project

The participant in this study are select by purposefully include 10 mathematics teachers, student in participating teacher's classes and 4 schools

Four schools, 10 math teachers seventh – grade address Nakornpathom Educational Service Area Office 1 , school contexts : 1) Pra Pathomvitayalai ; 2) Kohwungsai ; 3) Princess Sirindhon's College ; 4) Wat Pra Pathonjadee

The participants in the study were a convenience sample of 10 teacher educators teaching.
Figure 2

The Case : assessment system in mathematics instruction in 4 schools

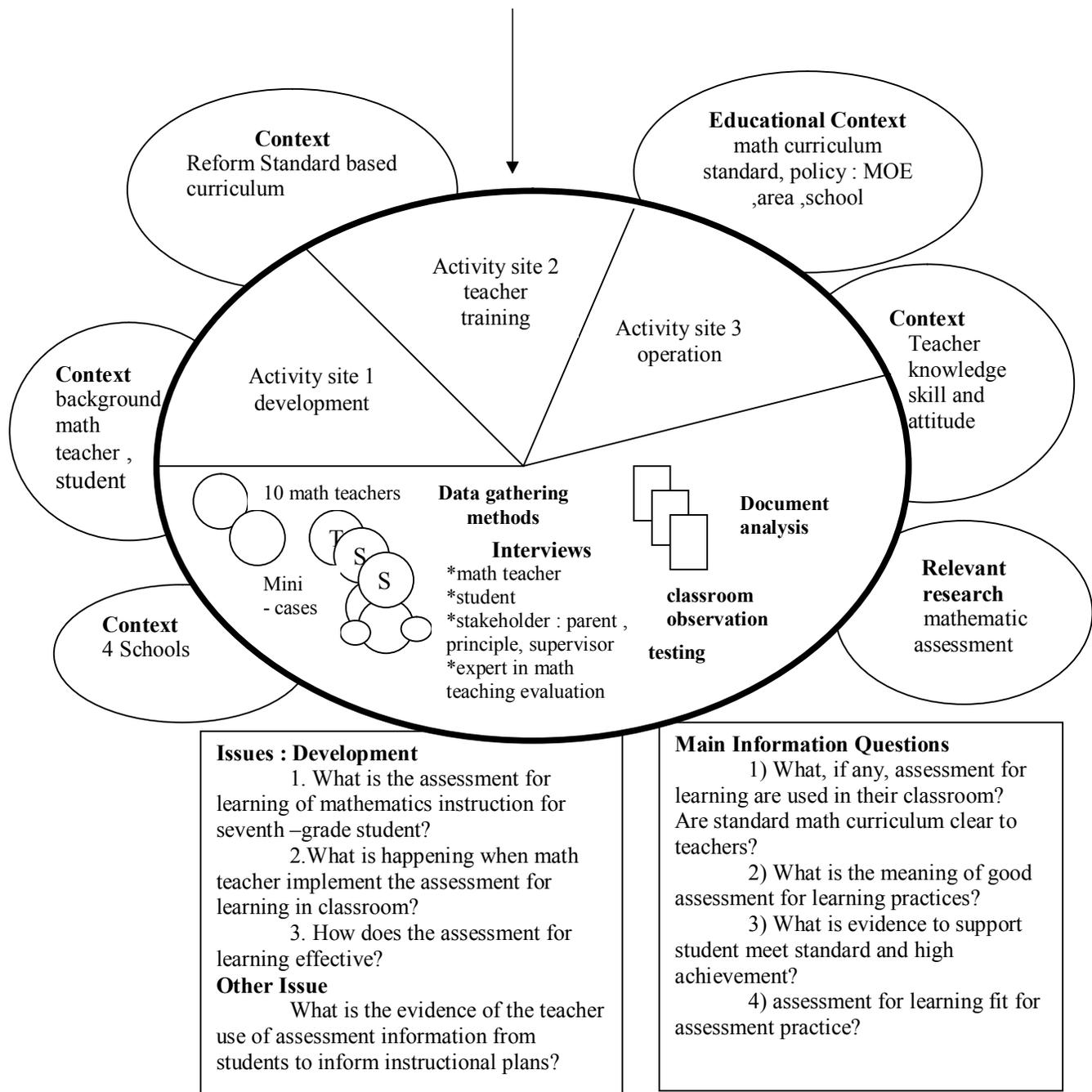


Figure 2 : The case assessment system in mathematics instruction in 4 schools

Results

In this section , present an Professional development during the case study has increased awareness of sound assessment practice with mathematics teachers :

“I think the assessment will be a good assessment tool for teaching a variety of tests such as observation. Question to the students design activities to assess learning and behavior include three aspects understanding the process skills and the desirable features”

“The assessment of learning difficulties in the process of designing and creating a check the quality of teaching and learning assessment tools are necessary and important”

"Assessment tools for teaching quality must be built and tested for quality"
 "The assessment will be a good evaluation tool for teaching a variety of tests such as observation. Ask the students. Design activities to assess learning and behavior include three aspects: understanding the process skills. And the desirable features."

An assessment System in Mathematics Instruction (AsSMI) comprises 3 principal components, namely 1) Curriculum Development System :CDS; based on Standard Based Curriculum (SBC : knowledge learner society 2) the instructional and assessment system (Understanding by design: UbD) 3) Assessment for learning (AfL) : effective feedback ,motivation , adjusting teaching, self esteem and objectivity based on 5 principle assessment for learning on UK assessment. Figure 3

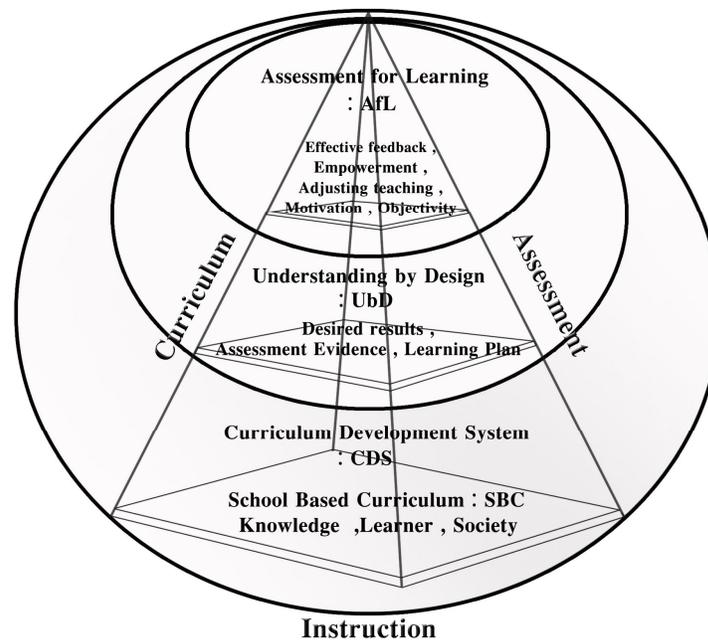


Figure 3 : Assessment System in Mathematics Instruction (AsSMI)

Principle

1. Developmental Perspective
2. Match between Instruction and Assessment
3. Quality Evidence

Objective:

1. To improve learning in Mathematics.
2. To feedback student's development of meaningful learning

Discussion

Mathematic teachers demonstrated a fairly conservative approach to assessment and teaching in mathematics at the beginning of assessment system with an interest in trying new ideas with his students emerging. This included an awareness of assessment for learning to enhance student learning and his own teaching. It was evident that teachers had adjust from an assessment of learning to an assessment for learning perspective.

A key feature for teachers in this study was the incorporation of the SOLO model as a theoretical framework. Based on working memory and student cognitive development it helped to explain to these teachers why particular strategies worked in the classroom and why other activities did not enhance student learning in mathematics. It was clear from their comments that the model provided a theoretical perspective that many found missing from many educational professional development activities.

Conclusion

Every important change in classroom teaching involves taking risks, and at least in the process of change, doing extra work (Black, et al., 2003). One of the area in assessment that is affected in the paradigm shift is on the place for classroom assessment Overall, it was evident that teachers had moved from an assessment of learning to an assessment for learning perspective.

Factors affecting condition assessment system to bring learning and teaching mathematics successfully. Monitoring is ongoing. The implementation is successful because the research is being tracked closely. Wait a consultant. Share ideas with teachers from start to finish. The teacher about the morale. And greater self-confidence. Trained as teachers to know or read manual system. Found that teachers can not do by themselves. They need more consultants to work for a while and to add their experience more. Teachers can continue to own .Attitude and dedication of the teachers. If teachers had good attitude toward teaching and assessment for learning. The system must be successful exactly.

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REFERENCES

- Anderson, L. W. & Krathwohl, D. R. (2001). *A taxonomy for learning, teaching, and assessing*. New York: Longman.
- Black, P. & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education*, 5(1), 7-74.
- Black, P., Harrison, C., Lee, C., Marshall, B. & Wiliam, D. (2003) *Assessment for learning: putting it into practice* (Maidenhead, Open University Press).
- Bell, B. & Cowie, B. (2001). The characteristics of formative assessment in science education. *Science Education*, 85, 536-553.
- Biggs, J. (1996) Enhancing teaching through constructive alignment. *Higher Education*, 32, 347-364.
- Biggs, J. & Collis, K. (1982). *Evaluating the Quality of Learning: the SOLO Taxonomy*. New York: Academic Press.
- Hattie, J. & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77(1), 81-112.
- Linn, R. L. (1990). Essentials of student assessment: From accountability to instructional aid. *Teachers College Record*, 91(3), 422-436.
- Merriam, S. B. (1988). *Case study research in education: A qualitative approach*. San Francisco: Jossey-Bass.
- Morgan, C. & Watson, A. (2002). The interpretative nature of teachers' assessment of students' mathematics: Issues for equity. *Journal of Research in Mathematics Education*, 33(2), 78-107.
- M. Birenbaum , K. Breuer , E. Cascallar , F. Dochyd, Y. Dori , J. Ridgway ,R. Wiesemes (Editor) g, G. Nickmans (Editor) ,A learning Integrated Assessment System. *Educational Research Review* 1 (2006) 61–67 .Available online at www.sciencedirect.com.
- Office of the National Education Commission [ONEC]. (2001). *Learning Reform: Learners as the most important*. Retrieved January 13, 2004, from http://www.onec.go.th/publication/4305008/st_center.pdf
- Pellegrino, J.W., Chudowsky, N. & Glaser, R. (Eds.) (2001). *Knowing what students know: The science and design of educational assessment*. Washington, DC: National Academy Press.
- Shepard, L.A. (2000). The role of assessment in a learning culture. *Educational Researcher*, 29(7), 4-14.
- Stake, R.E. (1995). *The art of case study*. Thousand Oaks, CA: Sage Publications.
- Stiggins, R. J. (2002). Assessment crisis: The absence of assessment for learning. *Phi Delta Kappan*, 83(10), 758-765.
- Stiggins, R. J. (2004). New Assessment Beliefs for a new school mission. *Phi Delta Kappan*, 86(1), 22-27.
- Stiggins, R. J., Arter, J. A., Chappuis, J., & Chappuis, S. (2006). *Classroom assessment for student learning: Doing it right – using it well*. Portland Oregon: Educational Testing Service.
- Torrance, H. (1995) The role of assessment in educational reform, in: H. Torrance (Ed.) *Evaluating authentic assessment: problems and possibilities in new approaches to assessment* (Buckingham, Open University Press), 144–156.
- Wiggins, Grant and McTighe, Jay. (2005) *Understanding by Design*. Alexandria, VA: Association for Supervision and Curriculum Development.