

Improving the Quality of Competency-Based Assessment through a Classroom Training Activity¹

*Ikhfan Haris², Wiwy Triyanty Pulukadang³, Rusmin Husain⁴, Asni Ilham⁵, & Gamar Abdullah⁶,
Universitas Negeri Gorontalo, Gorontalo, Indonesia*

Abstract

The objective of this paper is to contribute to the discussion and reflection of a classroom training activity as a method to improve the quality of competency-based assessment in the courses of Mathematics and *Bahasa Indonesia*. The Introduction describes the theoretical perspectives and the concept of competency-based curriculum as well as competency-based assessment. It also outlines a practical example of competency-based instruction in Mathematics and *Bahasa Indonesia*, as well as the structure of the new curriculum as a competency-based framework, an approach to assessment using summative or formative assessment. Furthermore, the paper explores active learning and active assessment with an example from a *Bahasa Indonesia* course using assessment observations and ongoing assessment as examples for competency-based assessment. Finally, the paper concludes with a detailed analysis of a method to collect evidence through analysis and compiling evidence through observation. There is a short identification analysis on participative learning and participative assessment in competency-based assessment.

Resumen

El objetivo de este artículo es contribuir a la discusión y reflexión sobre una actividad de formación en el aula como método para mejorar la calidad de la evaluación basada en competencias en los cursos de Matemáticas y *Bahasa Indonesia*. La Introducción describe las perspectivas teóricas y el concepto de currículo basado en competencias, así como la evaluación basada en competencias. También describe un ejemplo práctico de instrucción basada en competencias en Matemáticas y *Bahasa Indonesia*, así como la estructura del nuevo plan de estudios como marco basado en competencias, un enfoque de evaluación que utiliza evaluación sumativa o formativa. Además, el documento explora el aprendizaje activo y la evaluación activa con un ejemplo de un curso de *Bahasa Indonesia* utilizando observaciones de evaluación y evaluación continua como ejemplos de evaluación basada en competencias. Finalmente, el artículo concluye con un análisis detallado de un método para recolectar evidencia a través del análisis y compilar evidencia a través de la observación. Se realizará un breve análisis de identificación sobre el aprendizaje participativo, evaluación participativa en evaluación basada en competencias.

Introduction

In 2000 the Government of Indonesia introduced a new curriculum. This new curriculum adopted a competency-based approach to teaching and learning in Indonesian schools (Departemen Pendidikan Nasional, 2003). This approach is child-centred and outcomes-oriented. Child-centred means that the curriculum focuses on the needs, interests, and environment of the child (Griffith & Lim, 2010; Department for Education and Children's Services South Australia, 1997; Misbah, 2019; Sukandi et.al. 2001). Outcomes-oriented signifies that it is focused on developing competence as an outcome of the learning process (Mosher, 2011). The Kurikulum Berbasis Kompetensi (KBK) or Competency-based Curriculum also promotes activity-based learning (Bowden, 2004; Sturgis & Patrick, 2010), believing that children should be involved in the learning process by participating in activities that allow them to investigate, discover, make, and do (Oyugi, 2015; Ríos Muñoz & Herrera Araya, 2017; Serdenciuc, 2017). The answer to why KBK is important is the new perspective toward the new curriculum that requires a new approach to assessment. Teaching and learning through the KBK is child-centred, active, and participatory. In addition, assessment through the KBK should also be child-centred, active-dynamic, and participatory (Likisa, 2018; Nederstigt & Mulder, 2011; Sturgis, 2012).

The KBK Curriculum became a tool to raise learning standards and also to cast teachers as facilitators of student learning by encouraging them to tailor the curriculum to fit the unique interests and capacities of their students (Hefner, 2018; Yamin, 2007).

¹ Received: 24 June, 2020. Accepted: 3 December, 2020.

² ifanharis@ung.ac.id

³ wiwy_pulukadang@ung.ac.id

⁴ rusmin.husain@ung.ac.id

⁵ asniilham@ung.ac.id

⁶ gamar@ung.ac.id

In general, every new curriculum brings innovations and this is also the reason for the development of the KBK-Curriculum. The KBK curriculum was developed to break away from traditional curricula that had been used for many years. One innovative aspect of this curriculum is the focus on the assessment process: the use of authentic assessment where students can develop their higher order thinking processes through various assessment methods such as creating portfolios, completing assignments, writing papers, participating in group discussions, etc. In the assessments process of learning activities, teachers must be role models, build students' motivation, and develop their potentials and creativity through activities which inspire students to set and achieve goals that challenge them (Hasan, 2013). The implication of implementation of authentic assessments in the KBK curriculum is shifting the paradigm in the education process. Learning is an interactive process between teachers, students, and learning resources in a learning environment. The learning process requires planning, implementation, assessment, and monitoring in order to be effective and efficient.

Considering the diversity of students' cultures and backgrounds, and demands to produce qualified graduates, the learning process of every subject must be flexible and able to meet the requirements. According to Governmental Regulation Number 19 of 2005 on National Education Standards, one of the standards that requires development is process standard. Process standard is a national education standard related to the implementation of learning processes at each education unit in order to achieve graduation. It contains the minimum standard of the learning process at each unit within the legal territory of the Republic of Indonesia. This Minimum Service Standards of education applies to basic and secondary education units in formal pathways, both of which apply the package and semester credit system. Process standards include learning process planning, learning process implementation, assessment and monitoring to achieve effective and efficient learning processes (Departemen Pendidikan Nasional, 2003).

Competency-Based Mathematics Curriculum as an Example

Children learn mathematics best when they can understand what the ideas mean and when they know how these ideas can be used in their lives outside of the classroom (Ready et al. 2013; Watson & Ohtani, 2015). By using activities that involve the manipulation of real objects, children can make sense of mathematical concepts for themselves. It is by doing that they learn about the ideas and processes involved. The benefit of using this teaching approach is that students can also understand and demonstrate their ability in using math theories and the teacher who teaches conceptually for understanding instead of using rote rules can help students understand what makes sense in mathematics (Brownell, 1987; Burns & Hamm, 2011; Tipps et al. 2011).

To learn about measuring, for example, children can measure length in their classroom. For instance, children might use a ruler to measure the length of a table or a blackboard. They can also measure distance by giving the child the opportunity to jump as far as possible from one place that we have determined, for example by placing a tape. After jumping, the child will mark the spot they reached on their jump with a counter. Using a ruler or yard stick, children can measure the distance between the tape and the counters to find out how far they jumped. This learning practice could be done in the schoolyard (Thomson, 1991; Wyatt-Smith et al. 2014). They can even measure something at home. They can find things such as yarn or string that are long and short or count how many steps from one end of a room to the other. By using experiences with actual objects in these real situations, children build an understanding of measurement while also learning how to measure, develop accuracy as well as finding out about the relative values of the various standard units of metres and centimetres. Through this activity, students are expected to learn skills and build their knowledge to foster mathematical understanding and expertise. Learning about their surroundings through investigation and inquiry will make sense to a child when they have go beyond what they have been doing and how they have been thinking (Kaufmann & Dehline, 2014; Young-Loveridge & Bicknell, 2015).

From this example, it can be seen that many of the resources needed to teach mathematics in grades 1 to 3 are easy to find. Teachers can use leaves or seeds or even students' shoes. It is not hard to find realia, local materials such as sticks (lidi), stones, shells, beans, various seed pods and the like that can be used in classroom activities to measure or to learn about other mathematical concepts such as counting or adding. A significant advantage is that they are all readily available in our environment and will not cost very much, if anything at all.

Talking about a subject is also essential to learning it. Children need to speak with each other and with their teacher about what they are doing. This dialogue helps to develop their thinking and bring about a common understanding of ideas (Wangeleja, 2010). Gradually, children learn to use formal mathematical concepts, names, and symbols that are written in the curriculum documents (Gavrishina & Zaharov, 2015). Learning to write number relationships such as $2 + 3 = 5$, for instance, is one of the goals of the curriculum and one of the outcomes we want children to achieve. However, behind every mathematical symbol or expression is an idea or a relationship. Spending time developing an understanding of the concepts before introducing the formal terminology will bring meaning to these expressions, and will make sense for a learner (Stacey, 2016).

No longer is a mathematics lesson about lecturing or filling in pages of a textbook. Instead, teachers engage children in mathematical activities by giving them concrete examples to work with tasks which use appropriate concrete objects to teach particular math concepts/skills. In this environment, mathematics seems logical to children because they have developed it through their own actions and thoughts (Kytmanov et.al. 2016). This physical and mental activity keeps them interested and keen to learn.

In an active mathematics classroom, students will be involved in every lesson (Watson & Ohtani, 2015). They may be: (1) exploring mathematical ideas for themselves; (2) manipulating mathematical models; (3) using local materials and situations; (4) using local language to understand concepts; (5) sharing ideas, (6) listening to their teacher, and (7) building an understanding of the purpose of mathematics.

By its very nature, a competency based-curriculum centres on a student's activity and the learning outcomes that they are mastering as a result (Mamolo, 2019).

The Structure of the New Curriculum – A Competency-Based Framework

A new mathematics curriculum was introduced into all the schools in Indonesia since 2004. It has a focus on solving problems, reasoning clearly, and using mathematics in daily life. It is written using a competency-based framework and provides a structure for teaching. This framework consists of three main parts (Jácome, 2016).

Firstly, a base competency outlines the knowledge or skills that students are to learn and is usually used to express their potential up to the accepted competency level or higher in broad and general terms. Secondly, a learning outcome explains this competency further by providing details about what students are expected to demonstrate as a result of this learning. The last category is even more explicit because it identifies a series of indicators. These describe concrete things about long, or wide, or tall, children will be doing if they have acquired a particular concept or skill regarding to measure an object.

The following is an example.

Base competency	Learning Outcome	Indicators
Measuring length and weight	Measure and compare lengths	Students can: <ul style="list-style-type: none"> • Contextualize the attribute of distance by using words like long, short, near, far • Measure objects using non- standard units • Describe the differences between the range/period of things using non-standard units • Measure objects using standard units • Describe the differences between the length of things using standard units

The above table shows that the indicators are quite specific, describing the actions that children can do if they have acquired a particular concept or skill. To demonstrate competency of the first indicator – 'to emphasize the attribute of length by using words like long and short', for example, when a child can sort objects according to their lengths, distinguishing those that are long from those that are short- that indicator has been Table 1. Simple level of student's competences satisfied (Stacey & Wiliam, 2012).

An advantage of a competency based-curriculum is that the learning expectations are translated into actions. As the teacher observes the performance of students, it is always possible for them to know when a certain level of competency has been achieved (Wolf, 2001).

A New Approach to Assessment

Assessment of student learning is achieved by describing each child's ability to perform a particular series of tasks (Adelman, 1988; van der Vleuten & Schuwirth, 2019). Each learning outcome is clearly defined by a list of indicators (Maki, 2003; Smith et al. 2003). Further, these indicators are stated as actions that students can demonstrate in some obvious way.

The general process is for a teacher to see whether a child can perform these tasks or not. When they can, the teacher knows that they are ready to move on to the next level or stage of learning. On the other hand, if a child is not yet able to perform that particular task, then the teacher knows that further hands-on practice with the concept or skill is needed for that student to achieve proficiency. This action acknowledges that children learn at different levels. They will not all achieve a given competency at the same time. Some will always take longer than others to master a concept. When a student has demonstrated all of the indicators that are listed on the specific base competency, then the teacher can say that the particular skill has been achieved or is close to being achieved (Stupans, 2017).

A competency based-curriculum is based on the principle that all children are capable of achieving a set of skills (Franklin & Melville, 2015). As students succeed at one level, they move to the next one. A teacher's role is to plan this sequential progression for the students.

Mapping all the steps children take as they successfully progress towards being able to demonstrate an understanding or skill is called descriptive assessment because it tells us in observable terms what all the students can do. In other words, it acknowledges what they have achieved and describes how learning has changed. Explaining what a child can do is a positive and affirming method of assessment (Wongnaa & Boachie, 2018). Keeping track of a student's growth in mathematical understanding can be done by collecting examples of the developments as they occur (Suurtamm et al, 2016). The record teachers make of these growth indicators is called a portfolio. It can include samples of students' work as well as notes by the teacher about what children have done to show they have become competent in the desired skills and concepts.

In a knowledge-based curriculum, the focus is on learning and recalling information. In the KBK, the emphasis is on children achieving competence (Departemen Pendidikan Nasional, 2003). Capability is the ability to use knowledge and skill to investigate, discover, do or make something, such as solve a problem or make a storybook.

Assessment in the KBK is concerned with monitoring children's progress towards the achievement of competence (William, 2015). Examples of competencies are: (1) to be able to use numbers to solve problems, (2) to be able to measure and solve problems, (3) to be able to ask about something and (3) to be able to write directions. These competencies are developed throughout the time a child is at school. The level of competence expected of children in grade six is more significant than that expected of children in grade one.

Using their professional judgment, teachers must establish the level of competence expected of children in each class. The curriculum provides assessment indicators that can help with this such as developing and describing simple levels of competence for Class 1, 2 and 3 for one or more of the competencies above, shown in Table 1 below.

Competency	Class 1	Class 2	Class 3
able to use numbers to solve problems	✓	✓	✓
able to measure and solve problems	✓	✓	✓
ready to ask about something	✓	✓	✓
able to write directions	✓	✓	✓

Table 1: Sample level of student's competences

Summative and Formative Assessment

Assessment can either be summative or formative. Summative assessment occurs at the end of a program and represents a summary of what has been achieved (Stiggins, 1994). It usually takes the form of a series

of tests. Often a written report is produced for parents, children, and others. Formative assessment, on the other hand, is an on-going assessment that takes place throughout the learning process. Formative assessment informs students of the progress they are making and what they need to do next. Formative assessment also informs teachers about how they should plan the next activity. Evidence of formative assessment may be in the form of teachers' observations, checklists, written work, displays, performances, and work selected for inclusion in a portfolio.

Teachers assess learning results to measure students' competency achievement levels and create materials to write learning progress reports based on authentic assessment which gives the students an opportunity to demonstrate and use their knowledge, abilities to perform, to create, and to produce. Thus, this assessment plays a role in the learning process. Authentic assessment is done in consistent, systematic, and programmed ways by using verbal and written tests and non-test assessment⁷, performance observations, attitude measurements, scoring of students' creations in the form of assignments, projects and/or products, portfolios, and self-assessments. Assessment of learning accomplishments applies the Education Assessment Standard and Subject Cluster Assessment Guidelines.

Active Learning, Active Assessment, an Example for a Bahasa Indonesia course

The competency based-curriculum involves children in a wide range of active learning situations including the development and practical application of skills and knowledge in doing, making, explaining, and solving, to achieve competence in essential life skills. The curriculum demands that children develop individual positive values and attitudes. Attitudes and values are increasingly integrated into curriculum frameworks as an acknowledgement of the fact that competencies require more than knowledge and skills, but also attitudes, beliefs and values (Marcellino, 2005). Bonwell and Eison (1991) describe some characteristics of active learning: (1) students do more than listen; (2) more emphasis on developing skills than transmitting information; (3) higher-order skills are targeted (analysis, synthesis, evaluation); (4) engages students in activities (e.g., reading, discussion, writing); (5) greater emphasis is placed on students' exploration of their own attitudes, values, and prior experiences (Gogus, 2012). In the active classroom, active assessment has objectives, namely: (1) to provide feedback on student learning for both students and teacher/instructor/trainer; (2) to measure students' preparedness for the next course unit and (3) to direct students' learning (Fink, 2013; Kornhauser & Klaf, 2016; Millis, 2012).

To assess the outcomes of active learning, a dynamic approach to assessment is required. Dynamic assessment takes place as an integral part of active learning. It involves careful observation of what children do or say to gather evidence of achievement.

An indicator usually identifies this evidence. When a sufficient number of indicators have been successfully observed, it is determined that the child has achieved a competency level appropriate to his or her age and stage of development (Griffith & Hye-Yeon, 2014). This evidence may be (1) observed during classroom activity and (2) collected as an outcome of classroom activity.

It is not always necessary or desirable to limit the collection of evidence to written or other tests. With 105 Indonesian national assessment indicators for Mathematics and Bahasa Indonesia for Grade One, using only test criteria would be impractical.

Participative Learning, Participative Assessment

Active and participative learning involves children as decision-makers in the teaching and learning process. To be fully engaged, children should be familiar with the goals of the curriculum and included in the assessment process (Hickey & Anderson, 2007; Silver & Smith, 2015).

This process can be accomplished by making assessment child-friendly. For example, assessment targets can be simplified for children so that they know what they are expecting to perform. Children can be involved in assessing their performance, monitoring their progress, and selecting evidence of achievement for classroom display or for inclusion in their portfolio (Bates, 1983; Bosco, 2010; Hickey & Itow, 2012). Participative assessment also involves communication between the teacher and the child (Tsien & Tsui,

⁷ Non-test is an alternative assessment in the sense that it diverts from the paper-and-pen test. This instrument used in addition to learning achievement tests that can be used include observation.

2007; Willis, 2010). Through discussion, the child can understand the outcome of the assessment and know what they need to do in the future.

The following is an example of a simplified assessment sheet for class 1 mathematics. The questions are: (1) How could this be used? (2) Where could it be kept? (3) What evidence might be attached? And (4) What are the benefits to children?

Collecting Evidence through Observation

Routine classroom activities provide assessment opportunities. In this activity, all participants have a chance to conduct assessment observations and collect evidence of competence (Casabianca et al. 2013; Evertson & Green, 1986).

For this activity, the following strategies may be used: (1) Each group will read a local story together while the other groups observe and record (2) Each group should take ten minutes to prepare to learn. They might choose to read alternate pages or take on character roles. They should read with correct pronunciation and intonation.

Remaining members of the training group will record the readers' achievement in the Grade 3 Bahasa Indonesia competency 'read aloud texts', using the checklist below. The assessment indicator is 'read a text with attention to correct pronunciation and intonation'.

To make the activity more efficient, each group will be reading and assessing. After reading, students discuss the observation together as one group. the following guidance for questions is shown below (Table 2). The next query can be formulated as follows: (1) Is one assessment observation enough to determine competency? (2) What other assessments might be necessary? (3) What different types of the text might be used? and (4) what other observations can be made?

Class/Grade 3	Bahasa Indonesia	Reading
competency	able to read aloud texts	story text
indicator	read a text with attention to correct pronunciation and intonation	
Names	observations	

Table 2: Guidance for competence assessment questions

Designing Assessment Observations

Being able to read aloud also involves being able to understand or comprehend what has been read. Comprehension is often determined through question and answer about the content of the text.

In this activity, the task of the group is to develop an approach to assess the readers' comprehension of the text during a routine classroom activity. This could be done through activities such as 'hot seat', drama or role-plays using a context such as a radio interview, or a quiz.

The assessment indicator is 'answer questions related to the text orally and in writing'. In groups, design and conduct an observation and assessment of the reader's comprehension of the story, and the following observation record can be used (Table 3).

Class/Grade 3	Bahasa Indonesia	Reading
competency	able to read aloud texts	story text
indicator	answer questions related to the book orally and in writing	
Names	observations	

Table 3: Observation record of competence assessment

Collecting Evidence through Analysis

The children's output from routine classroom activities can provide assessment opportunities. In this activity, all participants will have a chance to conduct assessment observations using written or other evidence of competence (Fletcher, 2000; Matsom et al. 2013).

It is difficult to draw definite conclusions from a single piece of written work taken out of context (Sluijsmans et al. 2006). This assumption is especially true when the observer has limited information about the classroom activity, group interaction, and level of teacher support.

These limitations recognize the need for teachers to carry out a continuous formative assessment, collect evidence from a range of observations, and keep detailed records of achievement (Tovey et.al. 2015; Cunningham et.al. 2016).

Conclusion

Students' assessment should be considered an integral part of instruction. Each instructional activity could be seen as an opportunity for the teacher to assess as well as for students to learn. Through the use of a more realistic and continuous assessment, the teacher can illustrate a clearer picture of what their students have learnt. This information can be reported further through a descriptive assessment process. Detailed assessment is the mapping of all stages students passed through until they are capable of demonstrating an understanding or skill. Simply, this is describing everything students can perform in the assessment process. It reveals what has been achieved by students as well as explains how learning has changed the student.

In many education systems, people want to compare students' achievement. Educators, however, should not make an inequitable comparison. A fair conclusion can draw from assessment results, and an accurate comparison can only be made if data comprises student characteristics, opportunities to learn materials to assess sufficient learning resources, plus assessment method are available as instruments for assessment. The assessment process should also consider equity issues (Getting Smart, 2018). Equity means every student should have opportunities to learn the knowledge and skills assessed. It is inequitable if students are evaluated for materials they have never learnt.

Comparing students individually, especially with norm referencing, is not essential in a competence-based system. Comparing student groups (such as students from different schools) might be useful to emphasize difficult areas or highlight success of a particular learning approach. Nevertheless, assessment should be based on students' performance on a set of criteria, and not based on students' achievement compared to other students (refer to the norm referencing).

It is required of teachers to think of other ways of assessing and describing students understanding since traditional assessment methods may not provide compatible opportunities for students to open their minds to knowledge and skills assessed.

References

- Adelman, C. (Ed.), (1988). *Performance and judgment: Essays on principles and practice in the assessment of college student learning*. Office of Educational Research and Improvement. U. S. Department of Education.
- Bates, I. (1983) Participatory teaching methods in theory and practice: The Schools Council 'Careers' Project in school, *British Journal of Guidance & Counselling*, 11(2), 113-130. <https://doi.org/10.1080/03069888308253751>
- Bonwell, C. C., & Eison, J. A. (1991). *Active Learning: Creating Excitement in the Classroom AEHE-ERIC Higher Education Report No. 1* [ED336049]. <http://files.eric.ed.gov/fulltext/ED336049.pdf>
- Bosco, J. (2010). *Operational definition of "participatory learning"*. Consortium for School Networking Initiative (COSNI): Participatory Learning, Leadership & Policy.
- Bowden, J. A., (2004). Competency-based learning. In S. Stein & S. Farmer (Eds.), *Connotative learning: The trainer's guide to learning theories and their practical application to training design*, (pp. 91-100). Kendall Hunt.
- Brownell, W.A. (1987). AT Classic: Meaning and skill—Maintaining the balance. *Arithmetic Teacher*, 34(8), 18-25. <https://www.jstor.org/stable/41193147>
- Burns, B. A., & Hamm, E. M. (2011), A comparison of concrete and virtual manipulative use in third and fourth grade mathematics. *School Science and Mathematics*, 111(6), 256-261. <https://doi.org/10.1111/j.1949-8594.2011.00086.x>
- Casabianca, J. M., McCaffrey, D. F., Gitomer, D. H., Bell, C. A., Hamre, B. K., & Pianta, R. C. (2013). Effect of observation mode on measures of secondary mathematics teaching. *Educational and Psychological Measurement*, 73(5), 757–783. <https://doi.org/10.1177/0013164413486987>
- Cunningham, J., Key, E., & Capron, R. (2016). An evaluation of competency based education programs: A study of the development process of competency Based programs. *The Journal of Competency based Education*, 1(3), 130–139. <https://doi.org/10.1002/cbe2.1025>
- Dasar, S., & M. Ibtidaiyah. (2003). *Kurikulum 2004: Standar Kompetensi, Mata Pelajaran, Bahasa Indonesia*. Departemen Pendidikan Nasional.
- Department for Education and Children's Services South Australia, (1997). *Early literacy, practices & possibilities*. South Australian Government.
- Evertson, C. M., & Green, J. L. (1986). Observation as inquiry and method. In M. C. Wittrock, (Ed.), *Handbook of research on teaching* (3rd ed.). Macmillan.

- Fink, L. D. (2013). *Creating significant learning experiences: An integrated approach to designing college courses*. (2nd ed.). Jossey-Bass
- Fletcher, S., (2000). *Competence-based assessment techniques*. Kogan Page.
- Franklin N., & Melville P. (2013). Competency assessment tools: An exploration of the pedagogical issues facing competency assessment for nurses in the clinical environment. *Collegian*, 22(1). 25-31. <https://doi.org/10.1016/j.colegn.2013.10.005>
- Gavrishina, O., & Zaharov, Y., (2015). Competency-based approach in training mathematicians: Challenges of time. *Procedia-Social and Behavioral Sciences*, 214, 212 – 221. <https://doi.org/10.1016/j.sbspro.2015.11.665>
- Getting Smart. (2018). *Show what you know: A landscape analysis of competency-based education*. XQ Institute. https://downloads.ctfassets.net/35eubtuv0bcm/2kHpxOp59Om2Gma00ooiY/66eacb1be8051f2c54c1ad452e48490a/CBE_Show_What_You_Know_-_Getting_Smart_Commissioned_by_XQ_Institute.pdf
- Gogus A. (2012). Active learning. In N. M. Seel (Ed.) *Encyclopedia of the Sciences of Learning*. Springer.
- Griffith, W. I., & Lim, H-Y. (2010). Making student-centred teaching work. *MEXTESOL Journal*, 34(1), 75-83. http://www.mextesol.net/journal/index.php?page=journal&id_article=37
- Griffith, W. I., & Lim, H-Y. (2014). Introduction to competency-based language teaching. *MEXTESOL Journal*, 38(2), 75-83. http://www.mextesol.net/journal/index.php?page=journal&id_article=519
- Hasan, S. H. (2013). History education in Curriculum 2013: A new approach to teaching history. *Historia: International Journal of History Education*, 14(1). <https://doi.org/10.17509/historia.v14i1.2023>
- Hefner, R. W. (Ed.) (2018). *Routledge handbook of contemporary Indonesia*. Routledge.
- Hickey, D. T., & Anderson, K. T. (2007). Situative approaches to student assessment: Contextualizing evidence to support practice. In P. Moss (Ed.). *Yearbook of the National Society for the Study of Education: Evidence and Decision Making*, 106(1), 264–287.
- Hickey, D., & Itow, R. C., (2012). Participatory assessment for participatory teaching and learning in school contexts. In E. Reilly & I. Literat (Eds.), *Designing with teachers: Participatory approaches to professional development and education*, (pp.78-88). Project New Media Literacies.
- Jácóme, M.. (2016). Competency-based training model for mathematics teachers in virtual platforms. *International Journal for Cross-Disciplinary Subjects in Education*. 7(3): 2864-2868. <https://doi.org/10.20533/ijcdse.2042.6364.2016.0390>
- Kaufmann, K. A., & Dehline, J. (2014). *Dance integration: 36 dance lesson plans for science and mathematics*. Human Kinetics.
- Kornhauser, Z., & Klaf, S. (2016, August 3). *Active learning and assessment* [Power Point Presentation]. Paper presented in Symposium on the Use and Assessment of Active Learning in Mathematics. Columbus, Ohio. USA http://eduadvance.org/history_files/symposium_2016/visuals/klaf-kornhauser.pdf
- Kytmanov, A. A., Noskov, M. V., Safonov, K. V., Saveliev, M. V., & Shershneva, V. A. (2016). Competency-based learning in higher mathematics education as a cluster of efficient approaches. *Bolema*. 30 (56), 1113-1126. <https://doi.org/10.1590/1980-4415v30n56a14>
- Likisa, K. D. (2018). Challenges and prospects of competency based education: The case of Adama Science and Technology University alumni students and Hawas TVET College, Adama, Ethiopia. *The Journal of Competency based Education*. 3(2). <https://doi.org/10.1002/cbe2.1163>
- Maki, P. L. (2003). Developing an assessment plan to learn about student learning. *The Journal of Academic Librarianship*, 28(1-2), 8-13. [https://doi.org/10.1016/S0099-1333\(01\)00295-6](https://doi.org/10.1016/S0099-1333(01)00295-6)
- Mamolo, L. A.. (2019). Analysis of senior high school students' competency in general mathematics. *Universal Journal of Educational Research* 7(9), 1938 - 1944. <https://doi.org/10.13189/ujer.2019.070913>
- Marcellino, M., (2005). Competency-based language instruction in speaking classes: Its theory and implementation in Indonesian contexts. *Indonesian Journal of English Language Teaching*. 1(1), 33-44. <http://ojs.atmajaya.ac.id/index.php/ijelt/article/view/95>
- Matsom, H., Stott, T., & Tracy, F. (2013). The development of an e-portfolio for competency-based training assessment for a Malaysian skills diploma program. *Proceedings of the 5th International Conference on Computer Supported Education, Volume 1*. (pp. 386-392). <https://doi.org/10.5220/0004350003860392>
- Millis, B. J. (2012). *Active learning strategies in face-to-face courses*. IDEA Paper #53. IDEA. https://www.ideaedu.org/Portals/0/Uploads/Documents/IDEA%20Papers/IDEA%20Papers/PaperIDEA_53.pdf
- Misbah, Z.. (2019). *Teacher-student interaction in competence-based vocational education in Indonesia* [Unpublished doctoral dissertation]. Wageningen University. <https://doi.org/10.18174/477074>
- Mosher, F., (2011). *The role of learning progressions in standards based education reform*. Consortium for Policy Research in Education. https://repository.upenn.edu/cgi/viewcontent.cgi?article=1010&context=cpre_policybriefs
- Nederstigt, W., & Mulder, M., (2011, September 15). *Competence-based education in Indonesia. Evaluating the matrix of competence-based education in Indonesian higher education*. [Conference Session] European Conference on Educational Research, Berlin, Germany.
- Oyugi, J. L., (2015). Rational and challenges of competency-based education and training: The “wickedness” of the problem. *Journal of Education and Practice*. 6(14). 74-78.
- Ready, D., Meier, E., Horton, D., Mineo, C., & Pike, J. Y. (2013). *Student mathematics performance in year one implementation of Teach to One, Math*. Center for Technology and School Change (CTSC). Teachers College, Columbia University. http://digitallearningnow.com/site/uploads/2013/11/TeachtoOneReport_CTSC_Fall2013_Final.pdf
- Ríos Muñoz, D., & Herrera Araya, D. (2017). Los desafíos de la evaluación por competencias en el ámbito educativo [The challenges of competence-based assessment in the educational field]. *Educação e Pesquisa*. 43(4). 1073-1087. <http://dx.doi.org/10.1590/s1678-4634201706164230>
- Serdenciuc, N. L. (2013). Competency-based education: Implications on teachers' training. *Procedia - Social and Behavioral Sciences*. 76. 754-758. <https://doi.org/10.1016/j.sbspro.2013.04.200>
- Silver, E. A., & Smith, M. S. (2015). Integrating powerful practices: Formative assessment and cognitively demanding mathematics tasks. In C. Suurtamm & A. Roth McDuffie (Eds.), *Annual perspectives in mathematics education: Assessment to enhance teaching and learning*. Springer.
- Sluijsmans, D. M. A., Prins, F. J., & Martens, R. L., (2006). The design of competency-based performance assessment in E-Learning. *Learning Environments Research*. 9(1), 45-66. <https://doi.org/10.1007/s10984-005-9003-3>

- Smith, S. R., Dollase, R. H., & Boss, J. A. (2003). Assessing students' performances in a competency-based curriculum. *Academic Medicine*, 78(1), 97–107. <https://doi.org/10.1097/00001888-200301000-00019>
- Stacey, K. (2016). Mathematics curriculum, assessment and teaching for living in the digital world: Computational tools in high stakes assessment. In M. Bates & Z. Usiskin (Eds.), *Digital curricula in school mathematics*, (pp. 251–270).
- Stacey, K., & William, D. (2012). Technology and assessment in mathematics. In M. A. K. Clements, A. Bishop, C. Keitel-Kreidt, J. Kilpatrick, & F. K.-S. Leung (Eds.), *Third international handbook of mathematics education*, (pp. 721-751). Springer.
- Stiggins, R. J., (1994). *Student-centered classroom assessment*. Merrill.
- Stupans, I. (2017). A Curriculum challenge: The need for outcome (competence) descriptors. *Pharmacy*, 5(1), 7. <https://doi.org/10.3390/pharmacy5010007>
- Sturgis, C., (2012). *The art and science of designing competencies*. Competency Works.
- Sturgis, C., & Patrick, S., (2010). *When success is the only option: Designing competency-based pathways for next generation learning*. International Association for K-12 Online Learning.
- Sukandi, U. (2001). *Belajar aktif dan terpadu, apa, mengapa dan bagaimana* [Active and integrated learning, what, why and how]. The British Council. Jakarta.
- Suurtamm, C., Thompson, D. R., Kim, R. Y., Moreno, L. D., Sayac, N., Schukajlow, S., Silver, E., Ufer, S. & Vos, P. (2016). *Assessment in mathematics education: Large-scale assessment and classroom assessment*. Springer.
- Tipps, S., Johnson, A., & Kennedy, L. M.. (2011). *Guiding children's learning of mathematics*. (12th ed.). Cengage Learning.
- Tsien, T. B. K., & Tsui, M.-S. (2007). A participative learning and teaching model: The partnership of students and teachers in practice teaching. *Social Work Education*, 26(4), 348–358. <https://doi.org/10.1080/02615470601081654>
- Thomson, P. (1991). *Competency-based training: Some development and assessment issues for policymakers*. TAFE National Centre for Research and Development. <https://files.eric.ed.gov/fulltext/ED333231.pdf>
- Tovey, M. D., Uren, M. L., & Sheldon, N. E. (2015). *Managing performance improvement*. Pearson.
- van der Vleuten, C. P. M., & Schuwirth, L. W. T., (2019). Assessment in the context of problem-based learning. *Advances in Health Sciences Education*, 24(5), 903–914. <https://doi.org/10.1007/s10459-019-09909-1>
- Wangeleja, M. (2010). The teaching and learning of competency-based mathematics curriculum [Conference session]. *Annual Seminar of the Mathematical Association of Tanzania at Morogoro*.
- Watson, A., & Ohtani, M. (Eds.) (2015). *Task design in mathematics education: An ICMI Study 22*. Springer.
- William, D. (2015). Assessment: A powerful focus for the improvement of mathematics instruction. In C. Suurtamm & A. R. McDuffie (Eds.), *Annual perspectives in mathematics education: Assessment to enhance teaching and learning*. National Council of Teachers of Mathematics.
- Willis, J.. (2010). Assessment for learning as a participative pedagogy. In A. Gilmore (Ed.). *Assessment Matters 2* (65-84). NZCER.
- Wolf, A. (2001). Competence-based assessment. In J. Raven & J. Stephenson (Eds). *Competence in the Learning Society* (pp. 293-302). Peter Lang.
- Wongnaa, C. A., & Boachie, W. K. (2018). Perception and adoption of competency-based training by academics in Ghana. *International Journal of STEM Education*, 5(52). <https://doi.org/10.1186/s40594-018-0148-x>
- Wyatt-Smith, C., Klenowski, V., & Colbert, P. (Eds., 2014). *Designing assessment for quality learning*. Springer.
- Yamin, M. (2007). *Profesionalisasi guru & implementasi KTSP* [Teacher professionalization & implementation of KTSP]. Gaung Persada.
- Young-Loveridge, J., & Bicknell, B. (2015). Using task-based interviews to assess early understanding of number. In C. Suurtamm & A. R. McDuffie (Eds.), *Annual perspectives in mathematics education: Assessment to enhance teaching and learning* (pp. 67–74).