# A Guide in Assessing Knowledge, Process, Understanding, and Performance/Product (KPUP)

Carlo Magno
*Asian Psychological Services and Assessment*

Gabriel Sebastian Lizada
*Ateneo de Davao University*

**Abstract**   The aim of the present report is to provide a guide for educators in assessing knowledge (K), process (P), understanding (U), and product/performance (P) as part of the reform in assessment in the K to 12 basic education. The Philippines recently changed their basic education system to a one year of kindergarten and 12 year basic education known as the K to 12 Enhanced Basic Education. Part of the educational reform is a guide on how to conduct assessment in schools within a framework of Standards-Based Assessment. The new assessment system established a nomenclature of skills to be assessed among students that includes assessment of knowledge, process, understanding, and product/performance. The present report further defines and clarifies the domains of the nomenclature. The specific dimensions of these skills are outlined with some examples of assessment protocols under each.

*Keywords*: KPUP, Assessment, Knowledge, Process, Understanding, Performance/Product

Education in the Philippines has reformed to the K to 12 Enhanced Basic Education. Part of this reform is the development of a system of assessing student learning. The Department of Education (DepEd) developed a set of skills that needs to be assessed in the classrooms that is presented in a nomenclature composed of knowledge, process, understanding, and performance/product. This nomenclature was proposed in order to develop the necessary skills of school children. In the past curriculum, educators use different taxonomies that guide their assessment of students' learning such as the revised Bloom's taxonomy, Gagne's Taxonomy, Stiggins and Conklin's Taxonomy, Marzano's dimensions of learning, DeBono's six thinking skills, and

others. The new curriculum provides standards and a mechanism how to assess appropriately these standard skills. The specific domains of the nomenclature are based on some aspects of existing taxonomies. For example, the knowledge domain is similar with the recalling component of Bloom and Marzano. The understanding domain is based on the six facets of understanding by Wiggins and McTighe (2005). The process skills are based on theories of metacognition and self-regulation stemming from the work of Flavell (1979), Zimmerman (1999) and similar with the metacognitive system of Marzano.

The most popular taxonomy used in Philippines is Bloom's Taxonomy and the revised Bloom's Taxonomy (Anderson, et al., 2000). Bloom's taxonomy is divided into six cognitive levels, each increasing in complexity. The six levels are separated into two levels. The first level includes knowledge, comprehension and application with knowledge being the lowest and simplest cognitive skill. The other level is for analysis, synthesis and evaluation with evaluation being the most complex cognitive skill. Years after Lorin Anderson, a student of Bloom, revised the current taxonomy to rename it into the revised Bloom's taxonomy with minor changes in terms (Knowledge became Remembering, Comprehension became Understanding, Application became Applying, Analysis became Analysing, Synthesis became Evaluating, and Evaluation became Creating) but with significance (Forehand, 2012). Gagne's taxonomy provided another lense in viewing skills in terms of learning capabilities. These five are intellectual skills, cognitive strategies, verbal information, attitudes, and motor skills (Gagne & Briggs, 1979).

The Department of Education proposed that students need to be assessed on the domains of knowledge, understanding, process, and product/process (DepEd Order No. 31, s. 2012). This nomenclature were made in order for the students to reach the content and performance standards of the curriculum. The assessment system is described to be "holistic" where teachers use both formative assessment and summative assessment. Formative assessment involves students accomplishing a bank of items accompanied by a series of feedback; it is non-threatening and provides students a series of practice for the mastery of the lesson; it reinforces students understanding and interest in the subject matter (Black & William 2003; Gonzales & Birch, 2000). Kulik and Kulik (1998) explained that the best assessment practice incorporates several assessment and feedback that enhances students' learning. The nature of formative assessment provides a more authentic nature of student learning because it is a combination of what the students know and monitoring their progress. In a study done by Nicol and Macfarlane-Dick (2006) posited that formative assessment can lead to self-regulated learners. Students will be able to monitor and evaluate themselves during the learning session. In the same study, both authors came up with seven principles to help educators enhance self regulated learners in higher education. These principles (Nicol & Macfarlane-Dick, 2006, p. 200):

> (1) helps clarify good performance, (2) facilitates development of self assessment, (3) delivers high quality information to students about their

learning, (4) encourages teacher and peer dialogue, (5) encourages positive motivational beliefs and self-esteem, (6) provides opportunities to close the gap between current and desired performance and (7) provides information to teachers that can be used to shape teaching.

On the other hand, summative assessment is given when students have mastered the lesson, to determine the learners' achievement on a unit or course. In one study (Herppich, Witter, Nuckles, & Renkl, 2014), summative assessment and formative assessment worked together to enhance knowledge and learning of the learner. The results of the study showed that tutees that have teaching experience were more accurate in providing summative assessment to their learners as compared to the tutees who had no teaching experience. In this case, formative assessment was used as a method (feedback) in which the tutee can assess the summative assessment of the learner that showed improved accuracy with understanding after the tutor.

Formative assessment is emphasized in the new assessment system in order to help students reach the standards. Through a series and multiple assessments, the teacher is able to see the immediate evidence what students have learned and therefore be able to design and adjust the instruction based on their needs.

Assessment in the K to 12 becomes more useful to help students learn better. This brings in mind the idea of assessment "for" learning. According to Stiggins (2001) "when we assess for learning, teachers use the classroom assessment process and the continuous flow of information about student achievement that it provides in order to advance, not merely check on, student learning" (p. 5). This process requires teachers to become assessment literate where they should have the ability to transform their expectations into assessment activities and utilize the assessment results to further improve their instruction and eventually student learning. Following up on the study by Stiggins (2001), Chappuis and Stiggins (2002) forwarded the idea of a student-involved assessment in which students know that feedback on the assessment processes is used on them. This idea according to Chappuis and Sitiggins (2002) will help students with opportunities to communicate and check progress on their own. This will eventually lead to a better classroom for both the teacher and the student

Through formative assessment, the process of assessment becomes closely integrated with instruction and becomes instruction itself. Teachers may provide activities through games, small groups, exercises that immediately provide information on how the teacher begins her instruction. The teacher after teaching some small bits of skills follow with immediate assessment to determine if the lesson will be repeated or who among the students need further help. The actual activities in the classroom such as games can provide information to the teacher about what the students can and cannot do.

## Assessing Knowledge

Knowledge is defined by the Department of Education (DepEd Order No. 31, s. 2012) as facts and information that students need to acquire. The knowledge domain contains similar skills with Bloom's taxonomy that includes defining, describing, identifying, labeling, enumerating, matching, outlining, selecting, stating, naming, and reproducing. Examples of questions to assess the knowledge domain would include the following examples:

Table 1
*Example of Questions for Knowledge*

| Learning Areas | Performance Standard | Assessment question |
|---|---|---|
| English | Note specific details of the text listened to. | Who is the main character in the story? |
| Mathematics | Order sets from least to greatest and vice versa. | Arrange the following numbers from highest to lowest value: 8, 6, 9, 4, 3, 7 |
| Science | Labels the external parts of the human body. | Point to the illustration of the human body where the eyes are. |
| Social Studies | Nailalarawan ang mga anyong lupa. | Natutukoy ang iba't ibang anyong lupa. |
| Filipino | Natutukoy ang ginamit na unlapi sa bawat salita. | Guhitan ang unlapi sa bawat salita. |

## Assessing Process

Process is defined by the Department of Education (DepEd Order No. 31, s. 2012) as cognitive operations that the student performs on facts and information for the purpose of constructing meanings and understanding. Cognitive operations are specific procedures, tasks, heuristics, strategies, techniques, and mental processes that learners use in order to arrive with an answer. It is concerned with what individuals will do, think about, and go through in order to derive an answer. Cognitive operations are manifested when students answer word problems in mathematics and they show the teacher the strategy they used to arrive with their answer. After students explain the concept of electricity in science, the teacher may ask how they learned the concept. An English teacher can ask student their techniques how they identify adjectives and adverbs in a sentence.

Table 2
*Example of Questions for Process*

| Learning Area | Assessment Question | Cognitive operation |
|---|---|---|
| English | What strategy did you use to identify the topic sentence in the paragraph? | Strategic thinking |
| Math | Prove that $2 \times 10^2 = 100 + 100$ | Proving answers |
| Science | How did you learn the information that plants make their own food? | Techniques in generating knowledge |
| Social Studies | Paano mo mapapatunayan na tinulungan ng mga Amerikano ang mga Pilipino noong ikalawang digmaang pandaigdig? | Proving answers, data gathering |
| Filipino | Paano malalaman kung ang isang lupon ng mga salita ay parirala o pangungusap? | Strategic thinking |

The cognitive operations involve the use of metacognition, self-regulation, and learning strategies. Metacognition is thinking about one's thinking. According to Winn and Snyder (1998), metacognition is a mental process that involves monitoring the progress in learning and making changes and adapting one's strategies if one perceives he is not doing well. In a study done by Schraw, Crippen, and Hartley (2006), they studied meta-cognition (along with motivation and cognition) with self-regulated learners. Results of the study emphasize the importance of metacognition since it enables individuals to monitor their current knowledge and skills. On the other hand, process skills are also manifested through self-regulation. Self-regulation is defined by Zimmerman (2002) as self-generated thoughts, feeling, and actions that are oriented to attaining goals. Learners who are academically self-regulated are independent in their studies, diligent in listening inside the classroom, focused on doing their task inside the classroom, gets high scores in tests, able to recall teacher's instruction and facts lectured in class, and submits quality work (Magno, 2009). In a study done by Corsi (2010), results showed the self-regulated learning led to a better test scores, greater student involvement and decrease in student discipline issues. The same study also suggests that self-regulated learners have improved student achievement, increased motivation and provides a conducive learning environment. The idea now is that teachers do not only teach the content but also teach and assess these cognitive processes among students. These specific processes are detailed in tables 2 to 4.

Table 3
*Example of Tasks for the Metacognitive Process*

| Metacognitive Factor | Activity |
|---|---|
| Declarative Knowledge | Knowing what is needed to be solved<br>Understanding ones intellectual strengths and weaknesses in solving math problems |
| Procedural knowledge | Awareness of what strategies to use when solving math problems<br>Have a specific purpose of each strategy to use |
| Conditional knowledge | Solve better if the case is relevant<br>Use different learning strategies depending on the type of problem |
| Planning | Pacing oneself when solving in order to have enough time<br>Thinking about what really needs to be solved before beginning a task |
| Information Management Strategies | Focusing attention to important information<br>Slowing down when important information is encountered |
| Monitoring | Considering alternatives to a problem before solving<br>Pause regularly to check for comprehension |
| Debugging Strategies | Ask help from others when one doesn't understand<br>Stop and go over if it is not clear |
| Evaluation of learning | Recheck after solving<br>Find easier ways to do things |

Table 4
*Example of Tasks for the Self-regulation Process*

| Self-regulation Factor | Activity for students |
|---|---|
| Memory Strategy | Memorizing the names of the regions in the Philippines |
| Goal Setting | Expectations at the end of the class |
| Self-Evaluation | Proofreading paper before passing |
| Seeking Assistance | Asking for advice from teacher, parent, or expert. |
| Environmental Structuring | Setting up a conducive learning environment |
| Learning Responsibility | Setting timetable for projects |
| Organizing | Essay writing |

**Assessing Understanding**

Understanding is defined by the Department of Education (DepEd Order No. 31, s. 2012) as the enduring big ideas principles and generalizations inherent to the discipline which may be assessed using the facets of understanding. The perspective of understanding by Wiggins and McTighe (2005) is used. The big idea is "a concept, theme, or issue that gives meaning and connection to discrete facts and skills" (p. 5). Understanding is to make connections and bind together our knowledge into something that makes sense

of things. Wiggins and McTighe (2005) further elaborated that understanding involves "doing" and not just a "mental act" and thus includes application. Understanding was classified by Wiggins and McTighe (2005) into six facets: explain, interpret, apply, have perspective, empathize, and have self-knowledge.

Table 4
*Six Facets of Understanding*

| Explain | Provide thorough and justifiable accounts of phenomena, facts, and data. | Why is it that the fruits that are in season have cheaper prices? |
|---|---|---|
| Interpret | Tell meaningful stories, offer apt translations, provide a revealing historical or personal dimension to ideas and events; make subjects personal or accessible through images, anecdotes, analogies, and models. | What trend can be described in the graph shown? What is the meaning of the statement "an eye for an eye, a tooth for a tooth"? |
| Apply | Effectively use and adapt what they know in diverse contexts. | Which of the following situations use the first law of motion? |
| Have perspective | See and hear points of view through critical eyes and ears; see the big picture. | How will you classify insects if you are a frog? What will be the stand of the religious groups on the RH Bill? |
| Empathize | Find value in what others might find odd, alien. or implausible; perceive sensitively on the basis of prior indirect experience | Why did Lapu lapu immediately decide to fight Magellan when they were asked to pay taxes? |
| Have self-knowledge | Perceive the personal style, prejudices, projections, and habits of mind that both shape and impede our own understanding; they are aware of what they do not understand and why understanding is so hard | If the long method of multiplication is difficult for you, what other methods can you use to perform the same task? Why is the long method procedure difficult for you? |

## Assessing Products/Performances

Product and performance is defined by the Department of Education (DepEd Order No. 31, s. 2012) as real life application of understanding as evidenced by the students' performance of authentic tasks. This technique assesses what it is that students know and can do with the emphasis on doing. Students perform, create, construct, produce, or do something. Tasks that are authentic have a high degree of realism about them. Performance and product assessment involve activities for which there is no correct answer, continues over an extended period of time, and involves self-evaluation of performances. This assessment likely use open-ended tasks aimed at assessing integrated higher level cognitive skills. The product and procedure shown and demonstrated by the students is marked using checklists, rubrics, and scales.

Table 5
*Examples of Performance and Product Assessment*

| English | Compose a letter informing your school principal about your intention to run in the student council. Provide all the necessary parts of a letter. |
|---|---|
| Mathematics | Construct a poster illustrating the flight path of a basketball in a parabola. Estimate the vertex and roots. Students after computing will demonstrate the maximum height the ball bounced and total distance the ball traveled. |
| Science | Conduct an experiment to demonstrate the effect of a pollutant on the photosynthetic process of a leaf. |
| Filipino | Sumulat ng isang tula tungkol sa iyong paboritong pagkain. |
| Social Studies | Create a presentation to promote tourist spots in the Philippines. Include at least 10 pictures and provide caption for each. |

In writing performance based tasks, it is always important for the teacher to make the student understand the purpose of such activity. It has already been emphasized in the previous section that a high degree of realism should be involved to make the task relevant but more importantly interesting for the students. In writing performance based tasks, it is always important to target higher cognitive skills for better learning. The goal of such is to make it more meaningful and engaging to students for them to learn better and enjoy while they are doing it. When students become more engaged, they begin to enjoy learning.

In this report, discussion on how to improve learning is better recognized through the role of classroom assessment. Teachers are at the forefront in developing assessment processes and utilizing assessment data making the teaching and the learning process more meaningful. Sample protocols in assessing knowledge, process, understanding, and process/product are further provided to support better assessment practices of assessment.

## Recommendations

**Appropriateness in the use of traditional forms of assessment.** Teachers need to take note that only certain domains such as knowledge, process, and understanding can be assessed using traditional protocols. For the understanding, the facets on explaining, interpreting and applying are the only ones that can be assessed using traditional forms of assessment. The other facets such as empathy, taking perspective, and self-knowledge are best done on performance-based assessment. This can be assessed by the teacher during the actual instruction through open-ended formats. Some forms of process assessment are better suited as performance-based assessment requiring students to report the mental operations used in generating solutions, answers, and knowledge in general. When table of specifications is constructed for paper and pen tests, teachers at most can only include knowledge, explain, interpret, apply, and process skills. Performance and process skills would require the use of performance-based and authentic-based assessment.

**Using both formative and summative assessment.** Studies have shown that a combination of formative assessment and summative assessment can lead to better achievement inside the classroom (Herppich, Witter, Nuckles, & Renkl, 2014). Teachers could use both formative-summative approach as a way of interaction to the students so they will understand better the purpose of their tasks. As the educational system shifts, teachers also need to innovate ways that will make assessment meaningful for students. Providing constructive feedback (Formative assessment) and checking the learning of the student (Summative assessment) is a effective way of helping the learner become aware of their learning. By constantly providing feedback to students, teachers gain a better grasp of student's learning.

**Making students involved in the assessment process.** The study of Chappuis and Stiggins (2002) put forth a new idea in student-involved assessment. This tells us that teachers should not be the only one assessing performance but students need to have an active participation. This idea according to Chappuis and Stiggins (2002) will help build a better learning environment inside the classroom by making students more aware of their tasks. Teachers could look into the idea where students are involved in the assessment process to make them more engaged and gives them a sense of active participation inside the classroom. Student-involved assessment is a bold and new idea among educators but the effects are positive.

**Teachers need to be oriented on assessing the thinking process.** Teachers need to balance the assessment of cognitive and metacognitive skills. This can be done by the teachers through self-checking in terms of students outputs as part of developing the learning process. By combining formative-summative assessment and student-involved assessment with metacognition, teachers are shaping students to become thinkers rather than doers. This important step in thinking will hopefully lead to an action for students everywhere to become self-regulated learners.

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