Reflection Report

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1. CBC, CBE, and CBA as a System

CBC, CBE, and CBA function as an integrated and interdependent system designed to promote practical and holistic learning. CBC determines what students should know and be able to do. CBE provides the instructional methodology and pace tailored to individual learners. CBA measures whether learners can demonstrate the required competencies in real-world contexts. Together, these three components form a loop: curriculum sets the goals, education delivers the content and skills, and assessment verifies performance and application. In practice, I observed the effective implementation of this system during a professional development course for computer science teachers. In the "Data Structures in Python" module, course participants progressed through the content at their own pace, supported by individualized tasks (CBE). This approach allowed teachers' to master core competencies like problem-solving, algorithmic thinking, and debugging, aligning with CBC. The culmination of the module involved a real-world task: course participants were required to develop a Python program to automate a simple data processing task relevant to their own teaching context (CBA). This type of performance-based assessment gave them the opportunity to apply theoretical knowledge in practical ways, which is a defining feature of competency-based systems. However, challenges emerged. The diverse prior knowledge levels among participants led to unequal progress. Some teachers required additional guidance and more structured examples, while others moved ahead quickly. To address this, I plan to incorporate a system of differentiated instruction in future courses, ensuring scaffolding for those who need

it and enrichment for advanced learners. I also intend to develop tiered tasks aligned with the same competencies, allowing all participants to succeed at an appropriate level of complexity. Overall, implementing the CBC-CBE-CBA system created a dynamic, learner-centered environment that supports deeper engagement and improved learning outcomes.

2. Curriculum Development and Learning Goals

When developing a CBC, it is essential to define learning goals that are not only specific and action-oriented but also measurable and directly linked to real-world applications. These goals should reflect what learners must know and, more importantly, what they should be able to do with that knowledge. Unlike traditional learning objectives that often emphasize memorization, CBC emphasizes transferable skills, problem-solving, collaboration, and critical thinking. In my experience working with computer science teachers, I recognized how important it was to align all instructional content, activities, and assessments with these types of competencies. In a module titled “Creating Simple Artificial Intelligence Systems in Computer Science Classes,” the learning objective was for participants to build a basic neural network model in Python and explain its operation. This objective was designed to integrate both knowledge (understanding the architecture of a neural network) and application (coding and testing a model with real data). To achieve this, we used Jupyter Notebook for the practical component, where teachers created, trained, and tested a neural network using simplified datasets. This hands-on approach helped bridge theory with practice. Additionally, during group activities, learners visualized their work using Canva and shared their understanding through peer-reviewed presentations. The assessment was aligned with SMART criteria and Bloom's taxonomy—evaluating not only what learners knew but how well they could analyze and apply their knowledge. A self- and peer-assessment rubric encouraged reflection on collaboration, originality, and clarity of communication. One challenge that emerged was the varying levels of Python proficiency among participants. Some struggled with foundational concepts, which affected their ability to complete the task independently. Based on this, I plan to introduce diagnostic testing at the beginning of such courses to assess prior knowledge and customize support accordingly. This pre-course evaluation will allow for the creation of tailored learning paths and improve the effectiveness of curriculum delivery.

3. Assessment Quality: Validity, Reliability, and Fairness

High-quality assessment is a cornerstone of effective teaching and learning, especially within a CBE framework. Validity, reliability, and fairness are the three essential principles that ensure assessments genuinely measure learners’ skills and knowledge, produce consistent results,

and provide equitable opportunities for all participants. Without these pillars, even well-designed curricula can fall short in evaluating true learning outcomes. During the “Scratch, Python, and Artificial Intelligence Algorithms in Educational Practice” module for computer science teachers, assessment was designed to align closely with specific learning objectives. For example, the final project required participants to create an interactive program using Scratch or Python that solved a real-world educational challenge. This task exemplified validity, as it directly measured the intended competency: the ability to apply coding knowledge in a meaningful educational context. To promote reliability, we implemented a structured rubric with clearly defined and measurable criteria: content quality, technical implementation, creativity, and presentation effectiveness. The use of peer evaluation further enhanced consistency. After presenting their projects, groups assessed each other using the rubric, and scores were averaged to minimize individual bias. This triangulated approach helped maintain scoring integrity across diverse evaluators. Fairness was also a critical consideration. Participants varied in experience, digital literacy, and even physical abilities. To accommodate this, we implemented inclusive practices such as offering alternative instructions in written and visual formats, enlarging font sizes for visually impaired learners, and assigning facilitators to provide real-time support during coding exercises. These accommodations ensured all learners had equal opportunities to demonstrate their competencies, regardless of their starting point. Looking forward, I intend to incorporate statistical analysis tools—such as item difficulty indices and discrimination coefficients—to evaluate assessment tasks more objectively. These data-driven insights will guide future revisions of assessment tools, improving their validity and reliability even further, while continuing to uphold principles of fairness in a diverse learning environment.

4. Grading and Standard Setting

In competency-based assessment (CBA), scoring and grading are not merely tools for assigning numerical results—they serve as vital mechanisms for measuring the attainment of learning outcomes and guiding further development. An effective assessment system must be transparent, aligned with learning objectives, and flexible enough to accommodate the diverse needs of learners. In this context, standard setting refers to clearly defining threshold levels that determine successful competency acquisition. During the “Programming the Arduino Board” module of my course, learners completed a practical project: they developed a program to control an LED light using a sensor. The evaluation criteria were introduced at the beginning of the module to ensure transparency and learner preparedness. These criteria included the correctness of code structure, logical algorithm design, quality of execution, debugging skills, and clarity of explanation. Each criterion was linked to a specific competency, making the assessment both valid and meaningful. To ensure fairness and reliability, the assessment

included a combination of dichotomous (yes/no, correct/incorrect) and polytomous (multi-level) tasks. Dichotomous questions were used to check learners' understanding of theoretical concepts, while polytomous tasks assessed higher-order thinking skills, such as problem-solving, creativity, and innovation. This blended format enabled a comprehensive evaluation of both knowledge and skills. For scoring, I applied a mixed method of standard setting. In general, there are three widely used approaches: absolute (based on predefined benchmarks), relative (based on comparing learners' performance against one another), and mixed. For a 24-point rubric, I set the passing range at 13–17 points (absolute method), and also incorporated relative evaluation by considering the group's average performance to assess each learner more fairly. As a result, learners responded positively to this model and felt they had an objective understanding of their performance. In the future, I plan to further enhance and automate this mixed assessment approach.

5. Use of Rubrics

Rubrics are essential tools in competency-based assessment as they provide structured, transparent, and consistent criteria for evaluating learner performance. A well-designed rubric ensures that assessment is aligned with learning objectives, promotes fairness, and encourages self-regulated learning. In my teaching practice, rubrics have played a central role not only in grading but also in facilitating formative feedback and peer learning. During the course on "Flexible Strategies for Interaction with Students in an Interactive Learning Environment," I used a three-criteria rubric to assess participants' mini-projects on integrating digital tools into classroom practice. The rubric evaluated (1) relevance of content, (2) presentation quality, and (3) the speaker's delivery skills. Each criterion included three performance levels: basic, intermediate, and advanced—with clear, behaviorally anchored descriptors for each. By sharing the rubric with participants at the beginning of the activity, they had a clear understanding of what was expected and how they would be assessed. Moreover, peer-review was incorporated as part of the evaluation process. Learners used the same rubric to assess one another, providing both oral and written feedback. This approach promoted reflection, active listening, and mutual respect. It also cultivated learners' assessment literacy—an important but often overlooked competency. From my observation, students appreciated this process, as it increased their engagement and gave them a voice in the assessment process. To further enhance rubric effectiveness, I plan to introduce differentiated rubrics for future courses. These would allow for tiered criteria based on learners' entry-level skills and targeted outcomes. Additionally, I aim to integrate digital rubrics within learning platforms like Classroom or Moodle, enabling faster feedback cycles, easier data collection, and longitudinal tracking of learner growth. Ultimately, rubrics, when used strategically, are not just grading tools—they are instruments of learning. They support transparency, consistency,

and student empowerment by clearly articulating success and guiding reflection and improvement.

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