# Concept of Outcome Based Education: Primary science

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**Abstract**

*Science Education now is truly aiming to improve to quality education to develop knowledge and skills required. The need for outcome based science education has been there for decades. Outcome based science education is a practical approach to develop the curriculum with inclusion of learning practices and focus on the students rather than teacher. Outcome-based science education has many intrinsic benefits which must make it an attractive model for educationalist involved in curriculum planning, curriculum developers, teachers, employers, students. The article attempts to describe the concept of outcome based science education and also highlights the relationship of outcome based science education (OBSE) and students' centric learning which is imperative to achieve the desired outcome. Specifically and chronologically, this reflective article attempts clarification of key operational terminologies used, link between Competency Based science Education (CBSE) and OBSE, theoretical underpinnings of OBSE, challenges of OBSE, conclusions and recommendations.*

**Keywords:** *OBSE, CBSE, Student Centric Learning, Learning Outcome, Primary science*

## I. Introduction:

International and national agencies have recognized the role of education in building societies based on values of equity, social justice and have developed strategies and action plans. Outcome based science education has gained popularity due to the changing need of education system where greater emphasis is being laid on learning achieved by the students and not mere degree. The concept of OBSE emphasizes on a curriculum which have pre-defined set of learning outcomes. The curriculum should make it clear that what kind of skill set the students will possess after graduating from an institution. Outcome based science education is a well-established concept in the west. Outcome-based science education, as defined by Spady (1988) is a way of designing, developing, delivering and documenting instruction in terms of its intended goals and outcomes. Further Spady (1994) had defined OBE as "Outcome-Based Education means clearly focusing and organizing everything in an educational system around what is essential for all students to be able to do successfully at the end of their learning experiences." As contrast to the input based education were the focus was on input processes and happily excepting the outcome whatever it was. The purpose of outcome based science education is twofold, firstly designing the developing clear learning outcomes around which entire academic system can be woven and secondly establishing situations and occasions that encourage the students to achieve the pre-determined learning outcomes. The aim of the present study is to mention and highlight the contribution of various authors is the area of OBSE and propose a theoretical model for OBSE.

## II. Defining Outcome Based Education

Outcome-based education is a model of education that rejects the traditional focus on what the school provides to students, in favor of making students demonstrate that they "know and are able to do" whatever the required outcomes are. OBE reforms emphasize setting clear standards for observable, measurable outcomes. Nothing about OBE demands the adoption of any specific outcome. For example, many countries write their OBE standards so that they focus strictly on mathematics, language, science, and history, without ever referring to attitudes, social skills, or moral values. The key features which may be used to judge if a system has implemented an outcomes-based education systems are: Creation of a curriculum framework that outlines specific, measurable outcomes. The standards included in the frameworks are usually chosen through the area's normal political process. A commitment

not only to provide an opportunity of education, but to require learning outcomes for advancement. Promotion to the next grade, a diploma, or other reward is granted upon achievement of the standards, while extra classes, repeating the year or other consequences entail upon those who do not meet the standards. Standards-based assessments that determines whether students have achieved the stated standard. Assessments may take any form, so long as the assessments actually measure whether the student knows the required information or can perform the required task.

A commitment that all students of all groups will ultimately reach the same minimum standards. Schools may not "give up" on unsuccessful students.

Outcome based education is a model of education that rejects the traditional focus on what the school provides to students, in favor of making students demonstrate that they "know and are able to do" whatever the required outcomes are. OBE reforms emphasize setting clear standards for observable, measurable outcomes.

Spady (1994) is his book has highlighted that American education system is in dire need for OBE because of the dynamic and changing environment. The study conducted by Davis (2003) highlighted that OBE is not mere a method but an approach to education in which decisions about the curriculum are driven by the exit learning outcomes that the students should display at the end of the course. As proposed by Harden et. al. (1999) that there is a need that learning outcome of a program should clearly define what sort of students will a program produce? What competencies and skill sets they will possess? Zitterkopf (1994) is his study prompted that the variance between being outcome- based and simply producing outcomes is substantial. Outcome based Education is easy to define but difficult to implement the overall philosophy of this education lies in the curriculum that is driven by the outcome and learning that the student will exhibit after the completion of the course. Harden et. al.(1999). The curriculum based on Outcome Based Education has to align with the pre-set learning outcomes of the course, methods of teaching, student centric learning, pedagogical interventions and evaluation parameter to result in a robust and meaningful exercise. This should enable the students to demonstrate the requisite skills and knowledge of what was delivered during the course. As mentioned by Spady (1994) that outcome is not knowing but doing therefore it is important that a lot more emphasis should be given to the action oriented verbs while defining learning outcome in a given curriculum/course. Outcome-based education (OBE) is an educational theory that bases each part of an educational system around goals (outcomes). By the end of the educational experience, each student should have achieved the goal. ... The European Union has proposed an education shift to focus on outcomes, across the EU.

## III. Student Centric Learning

In short, student-centered learning (SCL) environment is one where the focus of instruction is shifted from the teacher to the student, with the end goal of developing students who are autonomous and independent, by placing the responsibility of learning in the hands of the students. Student centered learning has always been a long-standing topic of discussion among educators in higher education. A foundation study conducted by Tyler (1949) highlighted the important of curriculum design and the focus on students learning, the study 69 years back laid emphasis on student centric learning.

In a study conducted by Barr and Tagg (1995) described „„learning paradigm““ as one in which the goal is for our institutions to operate like learners, continuously learning how to produce more learning. Cannon and Newble (2000) define student-centered learning (SCL) as: ways of thinking and learning that emphasize student responsibility and activity in learning rather than what the teachers are doing. Essentially SCL has student accountability and activity at its heart, in contrast to a robust importance on teacher regulated and coverage of academic content in much conventional, moralistic teaching. With a student-centered approach more is needed from students than learning course content in order to pass an exam. If 'learning for the exam' is the kind of learning that got them into university, then student-centered learning strategies can threaten students' sense of proficiency or security if they are not sure exactly what learning is required and why. Ingleton et. al. (2000). Student-centered learning represents the following views: dependence upon active rather than passive learning, stress on deep learning and understanding, increased accountability and responsibility on the part of the student, an increased sense of independence in the learner, an interdependence between teacher and learner as divergent to complete learner dependence or independence (Fay, 1988). Wright (2011) in her book explains the various dynamics of SCL (1) the balance of power in the classroom, (2) the function of the course content, (3) the role of the teacher versus the role of the student, (4) the responsibility of learning, (5) the purpose and processes of evaluation. OBE and student learning are interlinked as any Outcome Based system would demand a student to act as a learner and not a mere observer, the student participation in an OBE setting is imperative for its implementation.

## IV. Characteristics of Competency-Based Learning

Characteristics of Competency-Based Learning have 3 Key. Competency-based learning empowers learners to focus on mastery of valuable skills and knowledge and learn at their own pace. This seems like a straightforward statement, but what does it mean in practice? Our competency-based education lexicon, developed in collaboration with the American Council on Education, helps chart the landscape of terms and concepts. How do we apply these concepts?

First, why do stakeholders in our educational ecosystems care about changing their practices to incorporate competency based learning? Part of the impetus comes from learner-centric shifts in education driven by social and economic pressures. There is also a growing realization that educational practices need to change to effectively focus on learning. And there are also potential benefits fundamental to the long-term success of our educational institutions.

Practical Benefits of Competency-Based Education:

- Efficient and potentially lower-cost degree/credential options for students
- Greater understanding of learning outcomes throughout the academic institution
- Courses, learning resources, and assessments aligned to well-defined goals
- Motivated and engaged students
- Increased student retention and completion rates, particularly when prior learning can be applied to degree progress
- Learners' improved ability to recognize, manage, and continuously build upon their own competencies and evidence of learning
- Employers' improved ability to understand graduates' competencies and learning achievements
- Outcomes-based frameworks for continuous improvement at course, program, and institutional levels

How do we achieve these benefits? Blackboard has been analyzing competency-based education models, practices, policies, and trends through independent research and now in joint competency-based education research with the American Council on Education. One obvious point verified by this research is that competency-based education approaches are already diverse and are continuing to evolve through the work of initiatives defining effective models. But another clear finding is that different approaches share the common characteristics of being learner-centric, outcomes-based, and differentiated. These characteristics help us understand competency based education in practice.

We also found that competency-based education practices do not need to be dramatic or disruptive. Many effective approaches incorporate competency-based learning processes into existing course and curriculum structures (see the American Council on Education's infographic). In fact, one of the reasons why there are so many different approaches is because educational institutions adapt competency-based learning to achieve their own goals. Competency-based learning does not happen in a vacuum. Nor does it need to be viewed as something outside or counter to our educational traditions and values.

Competency-based learning can be valuable for all of the stakeholders in our learning communities: learners have more opportunities to take ownership of their learning and expand their lifelong learning pathways; faculty grow professionally as they articulate the learning outcomes in their areas of expertise and embed them in rich learning experiences; academic leaders provide engaging curricula that advance knowledge and produce graduates who can demonstrate what they've learned; and institutional leaders focus on new ways of identifying barriers to success and achieving improved outcomes. The key characteristics of learner-centric, outcomes-based, and differentiated help us visualize what competency-based learning means to these stakeholders.

### 1. Key Characteristic: Learner-Centric

First and foremost, competency-based learning focuses on the learner as an individual. It provides opportunities for each individual to develop skills at their own pace, collaborate with others, collect evidence of learning, and become successful lifelong learners. Competency-based learning empowers learners to:

- Understand the competencies they need to master to achieve their goals
- Progress through learning processes without time constraints
- Explore diverse learning opportunities
- Collaborate in learning activities with communities of peers and mentors
- Create learning artifacts that represent their competencies
- Reflect on their own learning achievements
- See what they've mastered, what they still need to accomplish, and where to improve

- Develop an online academic identity, including the ability to manage competencies and portable evidence of learning from multiple sources

**2. Key Characteristic: Outcomes-Based**

Competency-based learning starts with well-defined learning outcomes. The structure for competency-based learning comes from creating, managing, and aligning sets of competencies to learning resources, assessments, and rubrics, with analytics to track performance. Focusing on outcomes empowers faculty and academic leaders to:

- Develop robust sets of learning outcomes and competencies
- Reorient curricular design to start with learning outcomes rather than starting with time/term structures
- Build high-quality sharable resources, assessments, and rubrics designed to support learning outcomes
- Foster authentic assessment that includes demonstrated mastery of competencies
- Effectively identify risk in students' progress toward learning achievements and provide appropriate interventions
- Support transparent analysis of learning outcomes at every level of the institution
- Achieve short-term and long-term academic performance improvements focused on outcomes rather than inputs

**3. Key Characteristic: Differentiated**

Differentiation refers to competency-based learning practices that recognize and adjust to meet the needs of individual learners. Differentiation is multi-faceted and applies to learner support, communications and interventions, as well as learning processes.

- Prescriptive/Diagnostic: providing different learning materials or assessments to learners based on what they've already mastered.
- Affiliation: learners receive different materials or delivery based on their relationship to the curriculum or program in cohorts or groups.
- Adaptive: content that is designed with learning alternatives and branching closely tied to the learner's specific interactions with the content.
- Choice: learners select from among different learning resources and pathways based on their own choices and preferences.
- Personalized messages & notifications: relevant, timely communications tailored to learners' individual activities and needs.
- Appropriate interventions: feedback, guidance, activities, or tasks designed to help individuals progress along their learning paths.

Most of these practices are already familiar and valued. This gives us many opportunities to be "now-ists" and foster bottom-up innovations that weave in more of the benefits of competency-based learning while building on the investments we've already made in well-designed learning opportunities.

Benefits to Innovating Competency-Based Learning within Existing Workflows:

- Leverage existing investments and valuable resources
- Lower barriers to entry and time to implementation
- Avoid costly retrofitting of deeply embedded processes
- Encounter fewer regulatory and accreditation complications
- Achieve faculty buy-in and engagement by focusing on learning outcomes rather than on disruption
- Meet existing faculty, student, and employer expectations because courses and credits are well understood
- Continue to transfer courses and credit hours for students moving among institutions
- Add new paths to employment rather than disrupting existing paths

We can take a variety of approaches to focus on learning outcomes throughout our learning ecosystems. Check back here to learn more about learning and assessment processes, evidence of learning, open badges, and validation and quality.

## V. Differences from traditional education methods

OBE can primarily be distinguished from traditional education method by the way it incorporates three elements: theory of education, a systematic structure for education, and a specific approach to instructional practice. It organizes the entire educational system towards what are considered essential for the learners to successfully do at

the end of their learning experiences. In this model, the term "outcome" is the core concept and sometimes used interchangeably with the terms "competency, "standards, "benchmarks", and "attainment targets". OBE also uses the same methodology formally and informally adopted in actual workplace to achieve outcomes. It focuses on the following skills when developing curricula and outcomes:

- Life skills;
- Basic skills;
- Professional and vocational skills;
- Intellectual skills;
- Interpersonal and personal skills.

In a regional/local/foundational/electrical education system, students are given grades and rankings compared to each other. Content and performance expectations are based primarily on what was taught in the past to students of a given age of 12-18. The goal of this education was to present the knowledge and skills of an older generation to the new generation of students, and to provide students with an environment in which to learn. The process paid little attention (beyond the classroom teacher) to whether or not students learn any of the material.

## VI. Benefits of OBSE

Definitions • Competency based education is an outcome focused approach that concentrates on the mastery of skills at the learner's pace rather than within a specific period of time.... COMPETENCIES • Competencies within different contexts may require different bundles of skills, knowledge and attitudes.

**Clarity**

The focus on outcomes creates a clear expectation of what needs to be accomplished by the end of the course. Students will understand what is expected of them and teachers will know what they need to teach during the course. Clarity is important over years of schooling and when team teaching is involved. Each team member, or year in school, will have a clear understanding of what needs to be accomplished in each class, or at each level, allowing students to progress. Those designing and planning the curriculum are expected to work backwards once an outcome has been decided upon; they must determine what knowledge and skills will be required to reach the outcome.

**Flexibility**

With a clear sense of what needs to be accomplished, instructors will be able to structure their lessons around the student's needs. OBE does not specify a specific method of instruction, leaving instructors free to teach their students using any method. Instructors will also be able to recognize diversity among students by using various teaching and assessment techniques during their class. OBE is meant to be a student-centered learning model. Teachers are meant to guide and help the students understand the material in any way necessary, study guides, and group work are some of the methods instructors can use to facilitate students learning.

**Comparison**

OBE can be compared across different institutions. On an individual level, institutions can look at what outcomes a student has achieved to decide what level the student would be at within a new institution. On an institutional level, institutions can compare themselves, by checking to see what outcomes they have in common, and find places where they may need improvement, based on the achievement of outcomes at other institutions. The ability to compare easily across institutions allows students to move between institutions with relative ease. The institutions can compare outcomes to determine what credits to award the student. The clearly articulated outcomes should allow institutions to assess the student's achievements rapidly, leading to increased movement of students. These outcomes also work for school to work transitions. A potential employer can look at records of the potential employee to determine what outcomes they have achieved. They can then determine if the potential employee has the skills necessary for the job.

**Involvement**

Student involvement in the classroom is a key part of OBE. Students are expected to do their own learning, so that they gain a full understanding of the material. Increased student involvement allows students to feel responsible for their own learning, and they should learn more through this individual learning. Other aspects of involvement are parental and community, through developing curriculum, or making changes to it. OBE outcomes are meant to be decided upon within a school system, or at a local level. Parents and community members are asked to give input in order to uphold the standards of education within a community and to ensure that students will be prepared for life after school.

## VII. OBE Use in Primary Science Education Context

Based on the findings of the above studies, highlight the implementation of OBSE framework in the general context, whereas the application of the OBE in Primary level becomes a real challenge. All the above mentioned studies are generalized in nature to either school level education where the students undergo similar curriculum and skillsets. OBSE Implementation Process

1. Establish Mission statements, Program Educational Objectives.
2. Map Mission Statements with Program Educational Objectives (PEOs)
3. Define PLO with Bloom's Taxonomy.
4. Map Program Educational Objectives with PLO.
5. Define CO (Course Objectives)

The OBE framework as suggested in the above mentioned studies may be applicable in Primary science education as students. They also proposed that the competency based education is required both for learner and policy makers though it will take time to implement but it will take shape in due course of time. Similarly, in management education managers must be able to regulate what information is needed and to obtain and interpret the information from the source available to them. By frequently challenging and managing ill-structured problems, students develop the ability to ask the right questions and to determine what information is needed to resolve the situation or problem. It is recall by many alumni when asked that they may have learned lot of theory but while application in real life they may have applied more of common sense than any theoretical framework. As per the above mentioned details a theoretical model for achieving outcome based education is proposed for management institutions which can be tested empirically. The model primarily focuses on the competency building of the students by exposing them to varied real life challenges and managerial problems.

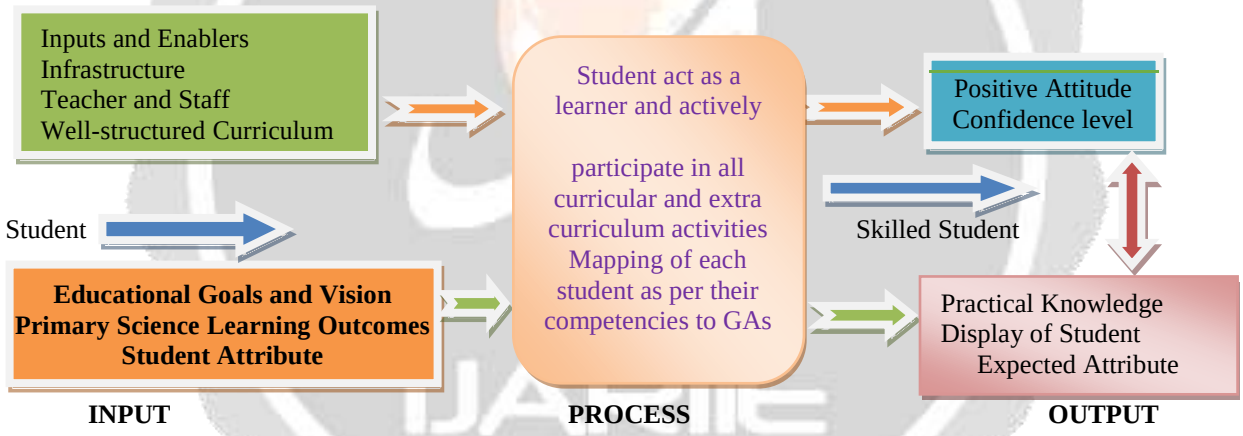


**Figure 1:** Advancement from Primary science student to a skilled student through active participation

A learning model of how a student becomes a Skilled Student. The model takes into account the input as enablers, processes as procedures and methods and outcome as results of management workplace education. The central condition for learning is sustained participation by students to a level that is suitable for his development. Through active participation, learners cultivate competence and sound state of mind. Superior aptitude leads to a more positive state of mind and higher learning capabilities. Evolving capabilities and a positive mind makes it easier for learners to participate, but the ability to participate completely depends on the behavior of people in the organization and the kind of interaction the learner has with various individuals.

## VIII. Conclusion

Based on the findings of the study, by the end of the educational experience, each student should have achieved the goal. The study concludes that available literature on OBSE is more focused towards under-graduate courses; therefore more work needs to be done at the Primary level as the issues and challenges at Primary level are entirely different. There is a strong need to move from teacher centric education to student centric education. The OBSE framework should focus on competency building and skill orientation rather than only theoretical knowledge. Proposed model can be empirically tested to establish a sound framework for successful implementation of outcome based education.

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