"Weakest link" in assessment design: a flowing target for outcomes-based approach (OBA) to teaching and learning?

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An approach to curriculum design, outcomes-based approach (OBA) to teaching and learning expects "clear articulation of learning outcomes", against which student learning is assessed. This paper points to an "inherent educational mismatch" in assessment design within the OBA framework and argues that the understanding of OBA impact on teaching and learning need be re-visited for the common good of sound education practice. The paper asserts that the nature of the types of learning outcomes expectations that higher education aspires to instil in students through curriculum design makes many of the learning outcomes currently articulated in OBA-based programme design "assessmentablly" challenging. The clarity of learning outcomes is challenged most with those learning outcomes more intangibly-weighted, and the difficulties of assessing them increase with those that are more remote. The argument bases itself on the following assertions and observations, and is substantiated with a case analysis of programme learning outcomes plans developed at one Hong Kong institution of higher education:

• Learning outcomes can be classified in terms of tangibility (substance/form) and remoteness (when to manifest themselves);
• OBA as an approach poses some inherent challenges to assessment design in that higher education expects instilment of higher-order thinking and cognitive development (the majority of whose outcomes are intangible and remote, and are frequently included in current higher education curriculum design, delivery and evaluation);
• A reality check finds that the teaching and learning processes in higher education are largely to provide opportunities to expose students to and develop meta-cognitive skills;
• Higher education could be described as providing (1) exposure (by teaching courses) to cognitive development; (2) processes (by requiring students to complete) for meta-cognitive development; (3) "re-affirmation" (by testing and evaluating students to assure the exposure and processes) with the hope that once students are re-affirmed of satisfactory exposure and completion, they will be able to use and apply what has been taught and practiced.

Two resultant implications, the paper argues, ask for proportion in articulating cognitive and meta-cognitive development outcomes, and a clear assessment design focus: assessing (and assuring) sufficiency of exposure and effectiveness and efficiency of processes completion.

Keywords: Outcomes-based approach, measurability, meta-cognitive development assessment

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1 Introduction

As part of its efforts to enhance the 3+3+4 change in the Hong Kong higher education sector, the University Grants Committee (UGC) encouraged its funded institutions "to move toward an 'outcomes-based' approach to student learning" (QAC Audit Manual, 2008:55). All the eight UGC-funded institutions began revising their curricula within the framework of this outcomes-based approach (OBA), and developed programme assessment plans.

As an approach to curriculum design, and also a major quality check requirement for programme accreditation, for instance, by ABET (2008) in the U.S., outcomes-based approach to teaching and learning expects "clear articulation of learning outcomes", against which student learning is assessed. Through internal alignment within the curriculum, namely, between learning outcomes and teaching and learning activities, between assessment activities and those teaching and learning activities, student achievement of intended learning outcomes can be demonstrated via a triangulation of assessment approach (Biggs, 2002) where assessment information from the teacher (course evaluation), students (student evaluation of teaching and graduate surveys), and employers (employer surveys) is aggregated. It is hoped that through such alignment within the curriculum and assessment design, student learning outcomes at the programme level as well as institutional level can be adequately assessed.

A re-analysis of OBA design, as is illustrated from a case analysis of OBA implementation at an institution, prompts a re-examination of the effectiveness and intended benefit of OBA in terms of how accurately such an approach could generate beneficial assessment information of student learning outcomes as expected at programme level, and its potential impact on teaching and learning at subject level. Based on the case analysis provided in this paper, the author makes the following assertion that there is an "inherent educational mismatch" in assessment design within the OBA framework, and this mismatch could potentially weaken the otherwise expected benefit that OBA framework could bring to teaching and learning.

2 A case analysis

Like its other UGC-funded institutions, the Hong Kong Polytechnic University started its academic curricula revision in 2007, infusing the OBA concepts in the revision process with several specific methods: articulation of programme intended student learning outcomes (PILO), integration of programme intended learning outcomes in the articulation of subject intended learning outcomes (SILO), curriculum mapping, and programme assessment design. Each academic programme completed its Programme Learning Outcomes Assessment Plan (P-LOAP), and started its pilot implementation during the academic year in 2009. Interim reports of the implementation were submitted in 2010. An analysis of the interim reports submitted from all the programmes reveals the following:

- An overwhelming number (over 98%) of programmes employed course-embedded assessment (CEA) method
- The two popular direct assessment approaches of CEA were embedding programme assessment questions in subject assessment activities (for instance, in the subject final exams), and re-calculation of subject grades (where subject grades were re-analysed to indicate the percentage of students with levels of achievement of specific programme learning outcomes)
- A very small number of programmes used external assessment instrument in measuring their students' performance against programme learning outcomes

- Assessment of intangible learning outcomes (many of which are labelled as generic skills) is left out of CEA, and left to the responsibilities of student affairs office people to assess through surveys
- Feedback from those programmes of their experience from their P-LOA implementation points to several ramifications:
- The need to take a re-look at some of the articulation of programme learning outcomes (their clarity and measurability)
- Design of teaching activities in subjects to truly reflect the subject contribution defined and assigned through curriculum mapping
- The need to distinguish between subject rubrics and programme rubrics

3 Analyses and discussions

The OBA concept makes the following assumptions that quality of teaching and learning could be assured when the teaching and learning processes are aligned with the articulated learning outcomes, and that assessment design so aligned with such teaching and learning processes as well as those learning outcomes would be adequately assessing student performance to provide evidence of students' achievement of those intended learning outcomes, as is illustrated in this statement from the QAC/UGC Audit Manual: "If assessment items are aligned to learning outcomes, the performance of students is an indication of the extent to which learning outcomes have been achieved" (54). The alignment expectation is a sound concept that respective teaching and learning activities should be so designed against those intended learning outcomes, and are so assessed. The data from the implementation by those academic programmes in the case analysis, however, provide a reality check: OBA, despite its sound concept, does manifest some "mishaps" in its implementation:

- Difficulties in articulating some of the learning outcomes in terms of **tangibility** (substance/form) and **remoteness** (when to manifest themselves)
- Challenges in assessment design in adequately assessing learning outcomes of higher-order thinking and cognitive development

3.1 Tangibility refers to the substance so produced in the learning outcomes and the form through which the recognizable substance is displayed. A learning outcome of expected mastery of discipline knowledge in engineering, for instance, could be demonstrated in students' recall, or comprehension (form) of concepts, principles, or theories (substance); students can demonstrate such recall or comprehension through discussions or classroom assessment tactics (CATs) during class, through subject evaluation at the end of a subject completion, or during programme assessment upon programme completion. It is found as reflected in feedback and reflections by many faculty members that language inadequacy hinders clear articulation of some of the learning outcomes for higher-order skills. The difficulties lie with the scope in which to articulate such learning outcomes, the degree to which those learning outcomes can be assessed, and the manner in which the learning outcomes so assessed could yield convincing results.

3.1.1 The scope in which to articulate learning outcomes deals with the substance represented in the learning outcomes, i.e., what it means to be able to perform an act in a certain way (for instance, "demonstrate ability in critical inquiry", or "be able to work effectively as individuals using their own initiatives, and as members of teams"). Very often, the learning outcome statement presents a rather intangible descriptor for anyone to pin down on some specific or concrete observational aspects. This inability presents challenges to define those outcomes operationally, and hence challenges to teaching as well as assessing.

3.1.2 The degree to which learning outcomes can be assessed is often expressed as measurability, i.e., if an outcome is described in such a way to be measurable. It is more difficult to assess a student's ability to think creatively than to assess a student's ability to provide a definition of creative thinking (compare these two programme learning outcome statements: "*Assimilate and implement new ideas resourcefully so as to become more flexible and adaptable to function in different employment environments and to cope with advance and change*", and "*Identify and invoke mechanism for the stimulation of creative thinking in the business setting*"; the former poses a more challenging task for assessment design than the latter which could focus on assessing students' identification process whether they can name or label such mechanisms so learned in class). In addition to its intangibility, learning outcomes such as creative thinking or critical thinking abilities, or team work do not readily lend themselves on concrete surface, presenting challenges to their assessment design.

3.1.3 The manner in which the learning outcomes so assessed could yield convincing results can be described as the level of acceptability by respective stakeholder groups. In other words, how well those stakeholder groups would be convinced of assessment information provided by a programme or an institution and its resultant conclusions. For instance, an assessment activity of a learning outcome of "*ability to apply strong communication skills to solve real-world problems effectively in local and global multilingual professional/business settings*" completed in a regular classroom environment would be difficult to be accepted as convincing evidence that students do possess that ability, as opposed to an assessment activity of "*a high level of professional communicative competence in English*" completed in a regular classroom evaluation which focuses on assessing students' linguistic competencies so operationally defined as language use and usage in their writing performance.

3.2. In contrast, another type of learning outcome of desired competency in critical thinking or analytical skills would require somewhat different platforms for students to demonstrate, as such competencies consist of abilities to perform in or act upon a (simulated or authentic) situation. In normal circumstances, situations encountered at work places are of higher authenticity. Students will not be able to have the opportunity to demonstrate such competencies authentically until after they graduate from college and begin their career.
To facilitate the discussions on the impact of authenticity in assessment platforms, remoteness in this paper is defined as the distance between students' acquisition or development of those less tangible competencies and their actual utilization in authentic situations. In other words, the closer to a work-place like environment (the farther away from college) where students perform, the more authentic their performance is; the more authentic the performance is, the more adequately and fully the students' performance of these less tangible competencies can be assessed. The degree of evidence of assessment becomes stronger (more convincing assessment results) when such assessment information comes from actual (or closer to) work environment (further remote from college).

4 Deficiencies in OBA

The assessment design under the OBA framework expects to assess students' outcomes (whether from students' artifacts or from authentic performance) against articulated learning outcomes. The focus in OBA is more on what students can do with what they have learned (Ewell, 2006). From the perspective of Bloom's taxonomy, student learning outcomes identified at the levels of application, analyses, and synthesis are of higher-order skills. The adequacy of how well students perform at those levels depends largely on how adequately the assessment activities are designed in enabling students to perform to their best. In other

words, an ideal assessment design would provide platforms close to an authentic situation where students can demonstrate their skills and competencies learned or developed in their academic studies.

OBA, however, is confronted with two dilemmas in dealing with (1) balance between tangible vs. intangible learning outcomes when college students are increasingly expected to achieve learning outcomes that are of intangible nature, and (2) assessment design for those intangible learning outcomes whose manifestation only becomes possible long after students leave college. In the PolyU case analysis, a larger percentage (over 70%) of articulated programme learning outcomes were of abilities to perform specific tasks (information recognition/identification, and its application), which does satisfy measurability. However, the small percentage of learning outcomes which are of higher-order skills contains the core value of higher education, but indicates a missed opportunity of representation in the academic curriculum of instilling higher-order competencies in college students. Equipping college students with skills and competencies is necessary for them to be more employable upon graduation, however, it is more important to remember that higher education is a place where those students expose themselves to opportunities of "cognitive knowledge development" (Sheppard, Macatangay, Colby, & Sullivan, 2009) so that they become life-long learners. Those intangible learning outcomes cannot be reduced at the expense of measurability. The current practice of utilizing CEA as a major programme assessment approach fails to adequately assess those intangible learning outcomes, as is illustrated in the PolyU case analysis. As a programme assessment approach, CEA serves as an economical assessment method at subject level to collect student learning outcome information for programme assessment purposes. CEA would be more illustrative for its assessment information when students' artifacts completed in their subjects are assessed with the help of programme assessment rubric. This is the case with a few programmes in the PolyU case, and the majority of programmes used a different approach in their CEA design: subject grades were re-calculated with the assumption that if subjects are aligned in their learning outcomes with some of the programme learning outcomes (through the curriculum mapping process), then, subject grades would reflect student achievement of those articulated programme learning outcomes.

5 Impact on teaching

Further analyses of the two dilemmas prompt critical reflections of how OBA could negatively impact teaching and learning, notably in three areas. One, more and more higher-order skills and competencies are expected of college students. Yet, the inability of OBA to assessmentally cater for such higher-order skills and competencies would make OBA less an appealing and sustainable framework, especially in academic fields (such as humanities) that traditionally seek more intangible learning outcomes. Two, the attempt to satisfy measurability in learning outcomes encourages modulization or de-fragmentation of competencies which consist of various components. Each component is integral to the whole, but does not fully represent the whole. In other words, OBA framework might be suspicious of diluting the complexity and wholeness of what higher education is expected to instil in students, by trying unintentionally to isolate individual learning outcomes in the name of measurability. Three, OBA framework could also be suspected of unduly favouring short-term values over long-term values. The former, referring to the traditional expectation of firm grasp of theories and principles (the "knowing that"), can be measured while students are still in college, and the latter, including those higher-order skills (the "knowing how"), can only be adequately assessed long after students leave campus.

A large percent of those articulated student learning outcomes are not in favour of many of the current in-school assessment designs in that those outcomes are ability- or competency-oriented, and require close-to-authentic situations for students to demonstrate what they can do of what they have learned. Many of the current classroom-based assessment design activities provide only proximity to authentic situations, and it is not possible or reasonable to expect them to have authentic situations.

6 Strengthening the assessment link

Despite such inherent weaknesses in OBA framework, the assessment design could still be strengthened in several aspects, and levels of triangulation (by stakeholders, by types of direct assessment information, and by assessors, described below) would provide just one remedy. Such multi-level triangulation, once in place, could help reduce the assessment design deficiencies aforementioned in assessing learning outcomes.

6.1 With rapid expansion of knowledge and multiple needs for both knowledge base and competencies, higher education needs to re-consider its traditional role of producing graduates who are expected to have merely achieved accumulation of knowledge acquisition, which now is considered rather limited and insufficient in the 21st century. Today's college students are expected to become whole-individuals who are knowledgeable both in "knowing that" and "knowing how" (Sheppard et al, 2009). While in college, students are exposed to an array of theories and principles (although still limited when considered in the total knowledge repertoire), and expected to learn and comprehend them. Because of ever increasing amount of knowledge in the discipline, faculty members have experimented with different teaching approaches to seek a balance between how much that can be taught and how much students will need to learn after college. For instance, engineering faculty in many U.S. colleges consider it to be important to teach students "deep knowledge", which will enable them to determine what specific knowledge they need to learn in solving specific problems (Sheppard et al, 2009). Equally (or more) important by many are these generic (also called "soft") skills or competencies that are discipline free and characteristic of a holistic developed individual. The expectation of colleges to help students develop these generic skills has led to curriculum re-design as well as more understanding of how such generic skills can be embedded in discipline studies. For instance, King and Kitchener (1994) categorize students' development of their reflective judgment into three levels (prereflective thinking, quasi-reflective thinking, and reflective thinking) during their cognitive development. At each of those levels, knowledge acquisition, its comprehension, and its application will require students to think differently towards knowledge. This ability "to evaluate knowledge, their epistemological assumptions and their ability to evaluate knowledge claims and evidence to justify their claims and beliefs" is part of the maturity development for college students (Sheppard et al, 2009).

6.2 Another area that is making contribution to quality teaching is the sciences of learning, how students learn. Learning sciences have provided powerful insights into how students learn and how such information can help us in designing curriculum, teaching activities, and assessment in an effective way (National Research Council, 2001). Faculty members involved in designing sound OBA-based teaching and learning activities would benefit from learning sciences to make their teaching activities such that can maximally "fit" the way students normally learn most naturally and effectively.

6.3 In the case of OBA, one way to strengthen its assessment effectiveness and validity can be considered in shifting the focus of learning outcomes articulation from emphasizing the "end-product" of those higher-order skills or competencies to emphasizing the process of achieving the "end-product". Difficulties of providing in-school assessment of the actual realization of those generic skills could be reduced when the articulation of these learning outcomes highlights the development processes. For instance, instead of expecting students to be able to demonstrate team work ability or critical thinking skills, a curriculum could emphasize the exposure to and experience of the processes where students learn what such abilities or skills entail, and practice how they can be deployed during carefully and meaningfully designed learning activities. Such meta-learning emphasis would enhance the assessment relevancy and feasibility. Information from such assessment could then be validated through an enhanced triangulation process described below.

6.4 In addition to strengthening the input part of the curriculum, the design of the teaching and learning processes could also be re-focused on developing students' meta-cognitive skills. Through quality engagement in and completion of tasks (projects, design, case analysis, capstone projects, internships, and work-integrated activities) that bear close proximity to the real world, students are encouraged to learn, practice, reflect, and improve their meta-cognitive competencies. Their performance will then be assessed through a student artifact-based CEA design. Instead of relying on course grades for assessing students achievement of intended learning outcomes at programme level, actual production (performance) by students (a sampling method could be used with a multi-year longitudinal design, collecting samples of students' work over a span of several years) is collected and assessed with a programme rubric. To enhance the validity of such CEA design, a multi-level triangulation by stakeholders, by types of direct assessment information, and by assessors could be utilized. The first level by stakeholders refers to the involvement of three groups: students (through their self-assessment and reflection, a meta-cognitive competence), teachers (through their course evaluation as part of their teaching processes), and employers (through feedback obtained from surveys and focused-group interviews). The second level by types of direct assessment information includes collection and assessment of students' performance in their respective course evaluations/exams (mastery of discipline knowledge), their performances in various task- or project-based activity completion (demonstration of specific skills and competencies), and their reflection and perceptions of their learning processes and experiences (affective cognition development). The third level of triangulation with assessment analysis processes involves faculty assessors from three background groups: faculty from within the discipline of the institution, peer faculty from outside of the discipline of the same institution, and faculty members from peer institutions. Evaluation and assessment by such diverse faculty assessors could enhance the internal validity of such CEA design and its results.

This multi-level triangulation design intends to improve the triangulation design currently employed (namely, triangulation by different stakeholder groups) which has its own deficiencies of de-concurrent assessment data aggregation (assessment information provided from employers is not made available with the same frequency as that from students and teachers, as employer surveys are normally administered with more than a year or two in between).

6.5 One of the defining features of OBA is the alignment between intended learning outcomes and teaching and learning activities. With an enhanced articulation of intended learning outcomes aforementioned, the inclusion of meta-learning would require corresponding assessment activities so designed that focus on assessing such meta-learning

(hence, alignment between assessment activities and teaching/learning activities). Assessment of students' exposure to (inputs and processes), participation in (processes), and completion of (processes and outputs) various curricular and extra-curricular activities, in-class and outside of class experiences, and formal (pre-designed) and informal (self-initiated) learning would significantly assure the fitness for purpose, another feature of OBA, and strengthen the linkage of assessment with other components within the OBA concept.

7 Conclusion

The effectiveness of any educational approach could only be "verified" by expected results. The validity and manifestability of such outcomes also need to be made possible by sound assessment methodology and design. The targets set by and intended to be achieved through OBA approach become clear and achievable with enhanced and fitting assessment design. The threats of OBA de-fragmenting the wholeness of educating college students can be dismissed when a balance is maintained between including sufficient higher-order outcome expectations and professional or disciplinary outcome expectations.

OBA as one of the many educational approaches for teaching and learning in higher education can be of a quality approach when each course within a programme is of high quality. In this regard, OBA serves as an important function of linking all those dots (individual courses within a curriculum) to eventually form a coherent plane (an academic major/programme), with the following three premises that all courses are aligned with the programme (course contribution to programme learning outcomes), what is being taught by teachers and demonstrated by students are aligned with the programme articulated learning outcomes (relevancy of teaching and learning activities to programme intended learning outcomes), and what is being assessed and how it is assessed are aligned with the former two premises.

It is hoped that through those enhancement efforts, the weakest link in assessment design will become a stronger link, helping to make OBA a sustainable and beneficial approach to teaching and learning.

References

ABET (2008). Accreditation Standards. Accreditation Board for Engineering and Technology (ABET).

Alexander, J.M., & Stark, J.S. (1986). Focusing on student academic outcomes. A working paper, National Center for Research to Improve Postsecondary Teaching and Learning.

Biggs, J. (2002). *Teaching for quality learning at university*. London: Society for Research into Higher Education & Open University Press.

Ewell, P. (2006). Applying student learning outcomes concepts and approaches at Hong Kong higher education institutions: Current status and future directions. A report prepared for the Hong Kong University Grants Committee. National Center for Higher Education Management Systems (NCHEMS).

King, P., & Kitchener, K. (1994). *Developing reflective judgment: Understanding and promoting intellectual growth and critical thinking in adolescents and adults*. San Francisco, CA: Jossey-Bass.

National Research Council (2001). *Knowing what students know: The science and design of educational assessment*. Washington, DC: National Academy Press.

QAC, Audit Manual (2008). Quality Assurance Council of the University Grants Committee, Hong Kong. Retrieved from: http://www.ugc.edu.hk/eng/qac/publication/publication.htm

Sheppard, S.D., Macatangay, K., Colby A., & Sullivan, W.M. (2009). *Educating engineers: Designing for the future of the field*. The Carnegie Foundation for the Advancement of Teaching, San Francisco, CA: Jossey-Bass.