ADVANCED FRAMEWORK FOR PRACTICAL AND CLINICAL OUTCOME BASED LEARNING IN OPTOMETRY

Ai-Hong Chen[♣]
Optometry, Faculty of Health Sciences, Universiti Teknologi MARA Cawangan Selangor, Kampus Puncak Alam
chenaihong@uitm.edu.my.

Azmir Ahmad
Optometry, Faculty of Health Sciences, Universiti Teknologi MARA Cawangan Selangor, Kampus Puncak Alam

Abstract: Frustrations can be caused by the mismatch between teachers' and learners' expectations leading to ineffective communication. Ineffective communication can complicate the learning environment, and the consequences are often underestimated. Bloom's Taxonomy has been widely used in the educational context to improve communication concerns, and optometry education is no exception. However, the implementation of outcome-based learning in Optometry predominantly from the practical and clinical perspectives remains indefinable. This conceptual paper is to postulate an advanced framework for outcome-based teaching and learning in Optometry. First, the overview of the three-phase progression in optometry outcome-based learning is presented with the emphasis on the respective subdomain in cognitive, psychomotor and affective domains. Then, outcome-based learning is elaborated further specifically from practical and clinical skill teaching perspectives. Receiving phenomena, remembering and understanding of facts are predominant in the theory-teaching phase. Responding to phenomena, application, conceptualization, visualization, verbalization, and practice are prevalent in the practical skill teaching phase. In the clinical teaching phase, the cognitive domain aims at the analysing-evaluating-creating level. This is aligned to the valuing-organization-internalizing value levels in the affective domain and the correction and reinforcement-skill mastery-skill autonomy level in the psychomotor domain. Four-competency classification in optometry clinical teaching is elaborated with the respective domains in outcome-based learning. The taxonomy plays a scaffolding structural supportive role to ensure that the educational process is corroborated in systemic, more manageable entities, without discouraging expansion of application and theory that may not fit the taxonomy.

Keywords: Optometry, outcome-based learning, outcome-based education, skill teaching, clinical, practical

1. Introduction

Bloom's Taxonomy has been widely used in the educational context worldwide (Bloom, 1994; Anderson et al., 2001; Krathwohl, 2002). The fundamental psychological element in learning embodies a hierarchical structure of learning, ranging from the straightforward and concrete to the complex and abstract (Bloom, 1994; Anderson et al., 2001; Krathwohl, 2002). The taxonomy is built upon a continuum of educational objectives categorized according to the cognitive, psychomotor, and affective domains. The application of Bloom's Taxonomy in the design of curricula and assessments was intended to improve communication between educators and learners (Bloom, 1994; Anderson et al., 2001; Krathwohl, 2002).

Outcome-based education (OBE) has been practiced at all levels of education in Malaysia for decades. However, the implementation of OBE at tertiary education is only obligatory from 2008 onwards to boost the quality and employability of local graduates. The implementation challenges of OBE among health or clinical disciplines remain a concern (Chen & Suhaimi, 2014; Chen & Suhaimi, 2016). One of the main hindrances is to quantify the practical and clinical teaching from OBE perspectives. Since the implementation of outcome-based learning in Optometry education is relatively still in its infancy stage, it obliges more intellectual inquiry to understand and refine the practical and clinical applications. In-depth understanding is essential to adopt and adapt OBE effectively without compromising the quality of Optometry program.

♣ Corresponding author: Ai-Hong Chen: Optometry, Faculty of Health Sciences, Universiti Teknologi MARA, Cawangan Selangor, Kampus Puncak Alam, Malaysia. chenaihong@uitm.edu.my

2. Outcome-Based Learning in Optometry

Optometry programs prepare students for their role as primary eye care practitioners, protecting patients' overall health and wellness by concentrating primarily on structure, function, and disorders of the eye where the emphasis is placed on the development of students' competencies through didactic and clinical teaching. Like all sub-fields of healthcare, optometry involves students' ability to communicate with patients effectively, to deliver safe treatment plans that demand critical thinking and problem solving, moral and professional ethics, and manage patients using a multidisciplinary approach, teamwork, and information management.

Lecturers from different health disciplines are continually seeking out more useful and meaningful strategies to engage students in learning. No doubt, various models can be utilized to structure teaching and learning. Five micro-skills have been used for structured teaching (Neher et al., 1992; George & Doto, 2001; Wolpaw, 2003; Bott, 2011) comprising five sequential skill levels: 1st skill – get a commitment; 2nd skill – probe for supporting evidence; 3rd skill – teach general rules; 4th skill – reinforce what was right; 5th skill – correct mistakes. This method, being sequential in nature, is known to be useful as it makes teaching and learning simpler, allowing for the micro-management of each stage. Thus, learners with difficulties integrating and visualizing all the knowledge and subsequent relationships adopted SNAPPS (S-Summarizing; N-Narrowing; A-Analyzing; P-Probing; P-Planning; S-Selecting) approach (Wolpaw, 2003). The SNAPPS emphasizes sequential and takes the learning further by incorporating interconnected visualizations, focusing more on the relationship between the sequences. Understanding of adult learning patterns (Speck, 1996), supervisory behaviour (Kilminster et al., 2007), conducive learning environment (Kilminster et al., 2007), well-taught decision-making and critical thinking skills (Ettinger & Rouse, 1997; Branch, 2002; Paul & Elder, 2004; Edwards, 2006), effective communication technique (Van de Ridder et al., 2008), and four areas of knowledge - knowledge about teaching and learning; knowledge about learners, knowledge about patients; knowledge about the subject (Spencer, 2003) are proportionately instrumental in the planning for teaching. Thus, the multifaceted role can be summarized as facilitating and providing experiential learning circles for learners through these four components (planning-experience-reflection-theory). However, it is believed that Bloom's Taxonomy provides a useful and fruitful structure that effectively underpins the three phases of Optometry Teaching. Furthermore, this taxonomy would also provide a measure of consistency in the model of instruction used in Optometry teaching in higher learning institutions, especially in Malaysia.

Optometry has a three-phase teaching: theory teaching, practical skill teaching, and clinical teaching (Chen & Suhaimi, 2014). Mapping the respective expected domain achievements for each phase, as shown in Table 1, assists the quantification of the practical and clinical teaching from outcome-based education perspectives. In the theory-teaching phase, the cognitive domain focuses on remembering and understanding facts. This is aligned to the affective domain's receiving phenomena level and the psychomotor domain's introductory exposure level. In the practical skill teaching phase, the cognitive domain converges on the application level. In contrast, the affective domain concentrates on the responding to phenomena level, and the psychomotor domain deliberates on the conceptualization / visualization / verbalization / practice levels. In the clinical teaching phase, the attention is on attaining the highest levels respectively, where the cognitive domain aims to analyse / evaluate / create levels. This is aligned to the valuing / organization / internalizing value levels in the affective domain and the correction and reinforcement / skill mastery / skill autonomy levels in the psychomotor domain.

Table 1: Three-Phase Progression in Optometry Teaching and the Emphasis of the Respective Domains in Outcome-Based Learning

Outcome-Based Learning	Three-Phase Teaching in Optometry		
	Theory Teaching Phase	Practical Skill Teaching Phase	Clinical Teaching Phase
Cognitive	Remembering Understanding	Applying	Analysing Evaluating Creating
Psychomotor	Introductory exposure	Conceptualization Visualization Verbalization Practice	Correction & reinforcement Skill mastery Skill autonomy
Affective	Receiving Phenomena	Responding to Phenomena	Valuing Organization Internalizing values

3. Practical Skill Teaching

Optometry practical skill teaching involves the step-by-step demonstration of individual procedures and practices such as history taking (of patients), entrance test, refraction, and ocular health. This practical skill teaching phase bridges the fact-comprehension of theory teaching with real patients' clinical exposure teaching. Learners undergoing the practical skill-teaching phase essentially go through four skill development training hierarchies – conceptualization, visualization, verbalization, and practice (George & Doto, 2001). This crossover period is a significant and salient preparation for real patient clinical teaching in the subsequent phase.

The teaching integrates the application of basic knowledge (cognitive domain) in optometry procedures (psychomotor domain). As mentioned earlier, four sequential steps are necessary for practical skill development and this includes conceptualization, visualization, verbalization, and practice (George & Doto, 2001). Learners first must understand the cognitive elements of the skill (conceptualization) and become familiar with the instruments and tools involved in the skill. The teaching procedure facilitates learning through imitation (visualization). Visualization engages the learners by getting them to observe the skill demonstrated in its entirety from beginning to end, which provides a model of the performance expected. The next step is for the learners to listen to a narration of the sequence of the skills along with a second demonstration (verbalization). If the learners are able to correctly narrate the sequence of the skill before demonstrating it, there is a greater probability that the learners will perform the skill correctly. This greater probability would ultimately lead to better learner manoeuvring.

After the learners have observed the skill, listened to, and repeated the narration correctly, they need to demonstrate their understanding by performing the skill. The skill can be further fragmented into three discrete units for practice (subcomponent practice, linkage practice and contiguous practice), leading to learner precision practice and eventual articulation (practice). These three discrete units begin with the subcomponent practice, followed by the linkage practice before ending with the contiguous practice. In subcomponent practice, the learners are drilled with each separate optometric procedure. In linkage practice, learners gather techniques from a pool of thought skills that refer to the same entity across different segments of a full eye examination. Learners practice according to the relevancy of the test. In contiguous practice, learners rehearse the connected skills in an unbroken sequence.

On the other hand, the affective domain entails active participation on the part of the learners (responding to phenomena). The ability to respond is needed to support the expansion of the psychomotor domain. Compliance, willingness, motivation, and behaviour should be closely monitored during this period of learning to ensure the progression of the affective domain is not neglected because it will later advance into characterization that is essential to complete the clinical training. A learner who fails to acquire and comprehend the knowledge (cognitive domain) most likely would fail to perform the skills to yield an accurate outcome (psychomotor domain). The practical skill teaching is considered successfully accomplished if it achieves application, responding to phenomena, and practice level in the cognitive, affective, and psychomotor domains, respectively.

4. Clinical Skill Teaching

Application of the Bloom's Taxonomy in clinical teaching, in particular, requires the involvement of three domains of cognitive, psychomotor, and affective. The cognitive domain refers to the intellectual aspect (Bloom et al., 1956), while the psychomotor domain refers to competency and skills (Harrow, 1972). The affective domain refers to the ability to develop internal changes (Krathwohl et al., 1964; Morshead, 1965). A holistically designed curriculum incorporates all three domains to produce graduates with the highest level of clinical skills. There are six levels of cognitive domains that denote the increasing complexity of cognitive demand. These sub-domains are remembering, understanding, applying, analysing, evaluating and creating (Anderson et al., 2001). The psychomotor domain contains a much more practical application. This domain includes conceptualization, visualization, verbalization, practice, correction and reinforcement, skill mastery, and skill autonomy (Harrow, 1972). The affective domain is sub-categorized into receiving phenomena, responding to phenomena, valuing, organizing, and internalizing values (Krathwohl et al., 1964; Morshead, 1965). The primary emphasis of clinical teaching is that the acquisition of competency in optometry embraces the amalgamation and interrelation of the cognitive, psychomotor, and affective aspects to provide safe and trustworthy eye healthcare to the public.

Clinical teaching provides students with the opportunity to develop a wide range of skills through experience with patients (Whitman, 1982; Carpinito & Duesphl, 1982; Issenberg & McGaghie, 2002). No doubt that there is no single prescription "fit for all" methodology to teach clinical students. Having said that, integrating Bloom's Taxonomy in clinical teaching provides some new avenues for clinical teachers to improve their teaching practices in the field of optometry. A structured clinical teaching module introducing clinical teaching concepts like RIME (Pangaro, 1999; DeWitt et al., 2008; Griffith & Wilson, 2008; Klocko, 2008), the five micro-skills (Neher et al., 1992; George & Doto, 2001; Bott, 2011), SNAPPS (Wolpaw, 2003) and Bloom's Taxonomy application in Optometry Clinical Teaching can help to narrow the gaps of subjectivity, inconsistency, and variation in clinical teaching (Whitman, 1982; Carpinito & Duesphl, 1982; Issenberg & McGaghie, 2002).

Theory teaching equips students with the facts and knowledge of basic and optometric sciences. Practical skill teaching involves applying that knowledge and the transformation of theory into procedures that prepare the students to perform safe procedures during clinical teaching years. Theory and practical skills are the prerequisite to enter clinical years in optometry. In clinical teaching, students go through four phases of transformation (Figure 1). The concept is adopted and adapted from the four stages of competence pyramid proposed by Flower (1999). The learning process progresses from the state of wrong intuition to wrong analysis and then evolves into right analysis before reaching the highest state of right intuition (Flower, 1999).

Similarly, students are initially unaware of how little they know. They usually start at the stage of 'unconscious incompetency', which is the initial stage of transferring practical skills into clinical procedures. Students tend to merely focus on completing each procedure precisely as taught in practical sessions. At this early stage, students are typically unaware of their 'incompetence' with the erroneous assumption that a passing grade at the practical level is equivalent to competency. Presuming that knowledge and skills are automatically transferred from the practical setting to the real clinical setting. Despite it being a prerequisite for students to proceed to the clinical stage, in reality, having passed the practical assessment alone cannot be considered sufficient to guarantee efficient and competent clinical performance with real patients. Every student at this 'unconscious incompetency' stage can gain experience and mature with a more real clinical case exposure. The SNAPPS approach of summarizing, narrowing, analysing, probing, planning and selecting can be beneficial here to stimulate the thinking mind in encompassing interconnected visualizations and focusing more on the relationship between the sequences. Once they understand and differentiate between ideal practical settings and real clinical settings, they will move on to the 'conscious incompetency' stage. Once the students recognise their clinical incompetence, they will consciously learn those clinical skills and consciously practice them to overcome their incompetence (Flower, 1999). At this stage, they begin to incorporate thinking in their routine and handle each case differently instead of remaining trapped in a rigid mindset that seeks to impose the exact procedure on all patients. Reflection, correction, and reinforcement play an essential role in enabling students to advance to the next stage – 'conscious competency'. At this stage, they have

developed the ability to evaluate their performance and organize this information into a management plan. They would have mastered all the skills in each procedure and would be able to perform with excellent efficiency. Eventually, clinical skills can be applied without being deliberately thought through (Flower, 1999). With more exposure, they would mature into 'unconscious competency'. This is the ultimate stage of competency where procedures are carried out automatically and effortlessly with some procedures flexibly adjusted or adapted according to the patients' needs. In the psychomotor domain of the 'unconscious competency' stage, students habitually pay attention to patients' responses and contemplate to create tailored management plans that fit well with individual cases.

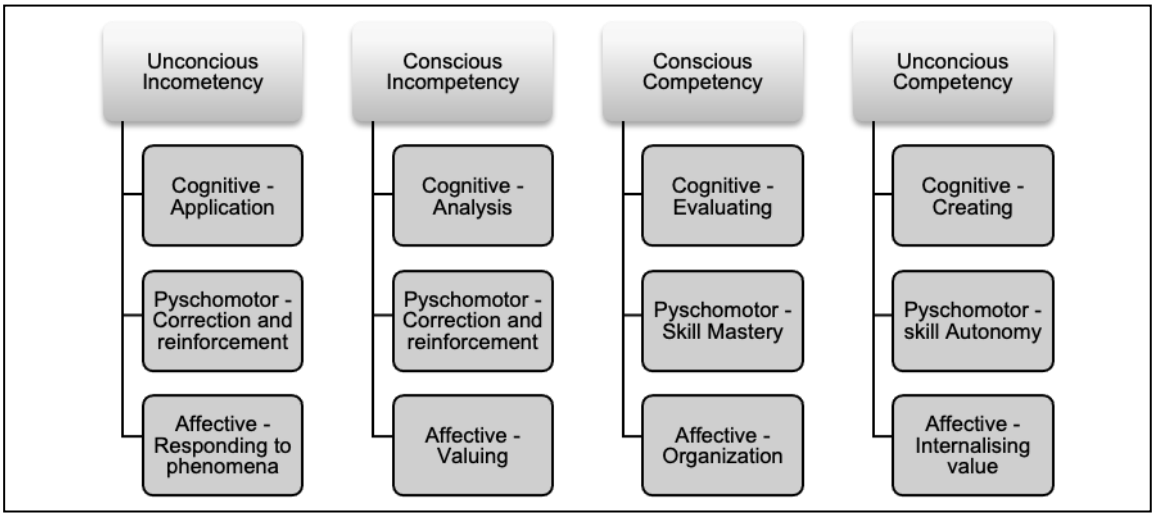

Figure 1: Four-Competency Classification in Optometry Clinical Teaching and the Emphasis of the Respective Domains in Outcome-Based Learning

5. Conclusion

The main aim of incorporating Bloom's Taxonomy is to enhance clinical teaching and learning quality by standardizing the assessment process, thereby eliminating biases. With the holistic mapping of the respective expected domain achievements in the theory teaching phase, the practical skill teaching phase and the clinical teaching phase provided here, educators in optometry field can adapt this mapping accordingly to develop their course rubrics in both formative and summative assessments. This OBE mapping also supports clinical supervision coordination and eases communication with external supervisors stationed in hospital and industrial placement. Educators in optometry field can use this mapping guide to discuss with external teaching staff and external clinical supervisors about the expectations of domain achievement in each phase.

However, it must be stated that an over-rigid reliance on Bloom's Taxonomy in the clinical setting might hamper the uniqueness of clinical teaching that encompasses myriad, intangible but crucial clinical skills. These skills occupy dimensions that are too ephemeral to be captured by current measurement tools. Ultimately, the taxonomy should uphold the educational process as supporting role without discouraging extension of application and theory that may not fit the taxonomy.

6. Acknowledgement

This study was supported by Research Entity Initiative (REI) grant [600-IRMI/REI 5/3 (016/2018)] from Universiti Teknologi MARA (UiTM), Malaysia.

References

Anderson, L.W., Krathwohl, D.R., Airasian, P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R., Raths, J., & Wittrock, M.C. (2001). *A Taxonomy for Learning, Teaching, and Assessing: A revision of Bloom's Taxonomy of Educational Objectives.* Allyn Bacon Longman.

Bloom, B.S. (1994). Reflections on the development and use of the taxonomy. In Rehage, Kenneth, J., Anderson, L.W., Sosniak, Lauren A., (eds.) *Bloom's taxonomy: A forty-year retrospective*. *Yearbook of the National Society for the Study of Education.* National Society for the Study of Education, 93 (2). ISSN 1744-7984

Bloom, B.S., Engelhart, M.D., Furst, E.J., Hill, W.H., & Krathwohl, D.R. (1956). *Taxonomy of Educational Objectives: The Classification of Educational Goals.* Handbook 1: Cognitive Domain, David McKay.

Bott, G., Mohide, E.A., & Lawlor, Y. (2011). A clinical teaching technique for nurse preceptors: The five-minute preceptor. *Journal of Professional Nursing, 27*(1), 35-42.

Branch, W.T. Jr., & Paranjape, A. (2002). Feedback and reflection: Teaching methods for clinical settings. *Academic Medicine, 77* (12 Pt 1), 1185-8.

Carpinito, L.J., & Duesphl, R.A. (1982). *A Guide for Effective Clinical Instruction,* Second edition. Aspen Systems Corporation.

Chen, A.H., & Suhaimi, A.T. (2014). Challenges in clinical teaching and learning in health care disciplines. *InCULT2014 (The 7th International Conference on University Learning and Teaching)*. Grand Blue Wave Hotel, Shah Alam, 2-3 Dec 2014. Conference abstracts InCULT 2014, 13.

Chen, A.H., Suhaimi, A.T. (2016). *The application of the concept of OBE in clinical teaching of health care education.* UiTM Press.

DeWitt, D., Carline, J., Paauw, D., & Pangaro, L. (2008). Pilot study of a "RIME"-based tool for giving feedback in a multi-specialty longitudinal clerkship, *Medical Education, 42*(12), 1205-1209.

Edwards, H. (2006). Critical thinking and the role of the clinical ultrasound tutor. *Radiography, 12*(3), 209-214.

Ettinger, E.R., & Rouse, M.W. (1997). *Clinical Decision Making in Optometry*. Butterworth-Heineman.

Flower, J. (1999). In the mush. *Physician Exec, 25*(1), 64-66.

George, J.H., & Doto, F.X. (2001). A simple five-step method for teaching clinical skills. *Family Medicine, 33*(8), 577-578.

Griffith, G.H., & Wilson, J.F. (2008). The association of student examination performance with faculty and resident ratings using a modified RIME process. *Journal of General Internal Medicine, 23*(7), 1020-1023.

Harrow, A.J. (1972). *A Taxonomy of the Psychomotor Domain: A Guide for Developing Behavioral Objectives*, David McKay Company.

Issenberg, S.B., & McGaghie, W.C. (2002). Clinical skills training-practice makes perfect. *Medical Education, 36*(3), 210-211.

Kilminster, S., Cottrell, D., Grant, J., & Jolly, B. (2007). AMEE Guide No. 27: Effective Educational and Clinical Supervision. *Medical Teacher, 29*(1), 2-19.

Klocko, D.J. (2008). Reporter, Interpreter, Manager, Educator (RIME): A novel enhancement to clinical evaluation methods. *Journal of Physician Assistant Education, 19*(1), 29-33.

Krathwohl, D.R. (2002). A revision of Bloom's taxonomy: An overview. *Theory into Practice, 41*(4), 212–218.

Krathwohl, D.R., Bloom, B.S., & Masia, B.B. (1964). *Taxonomy of educational objectives: The classification of educational goals*. Handbook II: the affective domain, David McKay Company.

Morshead, R.W. (1965). On taxonomy of educational objectives Handbook II: Affective domain. *Studies in Philosophy and Education, 4*(1), 164–170.

Neher, J.O., Gordon, K.C., Meyer, B., & Stevens, N. (1992). A five-step 'micro skills' model of clinical teaching. *Journal of the American Board of Family Practice, 5*(4), 419-424.

Pangaro, L. (1999). A new vocabulary and other innovations for improving descriptive in-training evaluations. *Academic Medicine, 74*(11), 1203-1207.

Paul, R., & Elder, L. (2004). *Critical and Creative Thinking*. The Foundation for Critical Thinking.

Speck, M. (1996). Best practice in professional development for sustained educational change. *ERS Spectrum, 14*(Spring), 33–41.

Spencer, J. (2003). Learning and teaching in the clinical environment. *British Medical Journal, 326*(7389), 591-594.

Van de Ridder, J.M., Stokking, K.M., McGaghie, W.C., Cate, O.T. (2008). What is feedback in clinical education? *Medical Education, 42*(2), 189-197.

Whitman, N. (1982). A guide to clinical performance testing. *iDEA paper no.7* (pp. 1-4).
Wolpaw, T.M., Wolpaw, D.R., & Papp, K.K. (2003). SNAPPS: A learner-centered model for outpatient education. *Academic Medicine*, *78*(9), 893-898.