

# Mathematics educators' perspectives on outcome-based education: Alignment with the learning paradigm of tertiary education in the Philippines

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## Abstract

This study utilized a mixed methods research approach to explore the perspectives of Mathematics educators about Outcome Based Education, or OBE, in Isabela, Philippines. Forty-seven educators from twenty-two higher education institutions were selected. Data was gathered from true-false and open questions, personal interviews and the review of documents. Descriptive statistical and thematic analysis was used on these data sources. The findings of the research revealed that most of educators that took part in the research did not have sufficient knowledge about OBE. This led to them failing to comply with the OBE premises and principles. The perspectives and attitudes of the educators also showed that they could not currently get away from using conventional non-outcome-based practices. They therefore find it difficult to constructively align the curriculum and assessment in their courses with the attainment of desired outcomes for their students. A training program was designed as part of this research to overcome these issues.

**Keywords:** Outcome-based education, perspectives, OBE dimensions, learning paradigm, constructive alignment

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## 1. Introduction

The ASEAN Economic Community aims to transform its members into one region with free movement of products, materials, and human resources [1-2]. The transformation requires cooperation, between member countries in many areas. One of these is the recognition of professional qualifications and the setting of criteria which should be met by professionals seeking employment elsewhere in the region [1-3]. This, however, increases competition for employment among graduates of the ASEAN member-states.

The Philippine government, through the Commission on Higher Education (CHED), has initiated projects which aim to raise educational standards and the standard of professional qualifications in education to produce more marketable graduates to enhance their ability to work elsewhere in the ASEAN region [3-4]. The commission states that it implemented a policy in order to "...enhance quality assurance in Philippine higher education through an outcomes- and typology-based quality assurance (OTBQA)" [3, p.1].

This requires all Philippine higher education institutions, HEIs, to align their learning environment with their defined and measured vision, mission and outcomes. It requires institutions to change their approach from being teacher-centred or inputs-based to student centred or outcomes-based [5, 6]. This had led to the development of Outcome-Based Education as a new direction for tertiary education in the Philippines.

OBE is a transformational educational approach associated with William Spady [7-13]. It is a method which is currently favoured by many countries and states around the world [13-15] such as the USA, Canada, New Zealand [14], Hong Kong [16], and all of the members of ASEAN [1]. It is an internationally recognized educational trend [14] that focuses the curriculum and assessment on what educators want their students to be able to achieve competently following their training [7-8, 17-19].

It is believed that OBE produces highly competent and employable graduates [1, 13]. However, for its implementation to be successful it demands the cooperation of educators who are directly involved in the implementation of the new approach [8, 17, 20-21].

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Spady, who is regarded as the “father of OBE”, places the major role in implementation on educators. This is done to understand the condition of success among students studying their courses [8, 12, 17, 22, 23]. The literature states that the success of OBE depends on “how” and “how much” it was understood by educators [8,17,20] This suggests that the most important factor that could make OBE successful is the ways in which educators’ understand, interpret, and view it.

It is fair to say that individuals cannot give what they do not have. Educators cannot do effectively those things that they do not understand clearly and comprehensively [24-25]. The successful implementation of OBE therefore necessitates educators’ sound perspectives on the 6 following key OBE principles [20, 26]; mission, criteria for success, teaching-learning structure, nature of assessment, theories, and nature of roles [6, 27]. Their awareness and understanding of these principles are essential for them to know when, how, and what to do to become successful educators in an outcome-based system. Understanding of these principals can increase the likelihood of successfully putting an outcome-based approach into practice. Without this understanding amongst educators, OBE might fail to achieve its purpose [8, 20, 26] and may not improve the quality of university graduates in the country [13].

Previous studies have found that many university level educators are still using direct instruction and assess their students with tests at the end of teaching-learning activities [20, 28]. In the Philippines, direct instruction and class tests are common methods used by Mathematics educators [28]. In OBE Mathematics educators should act as learning facilitators rather than lecturers and are encouraged to use alternative authentic assessment over traditional assessment methods such as tests [3, 5-6].

It is therefore important and interesting to understand the extent to which Mathematics educators have implemented OBE in practice. Gathering the opinions of Mathematics educators about OBE could also reveal their attitudes towards such type of education. It was thought to also be interesting to know whether or not the educators themselves wanted to change their approach towards an outcome-based education.

This research therefore aimed to examine Mathematics educators’ perspectives on the six key principles of OBE that were discussed earlier. This research should also serve as a monitoring tool which could be used to understand the extent of implementation of OBE among college Mathematics educators. It could be used to gauge whether or not they are coping with the current tertiary education trend towards OBE. The findings of the study are hoped to provide significant inputs in crafting a faculty development training program that is focused on the educators’ attributes that need to be immediately addressed and corrected for a better implementation of outcome-based mathematics

education.

## 2. Methods

Mixed-methods were used for this research. A questionnaire, interviews, and a document review was used in order to establish and draw out the views of educators on OBE. The study took place in Isabela, Philippines, the second largest province in the country. The study was carried out of two consecutive semesters. Forty-seven Mathematics educators from twenty-two universities in the province were selected as participants for the research using purposive typical sampling. A typical sample is one whose characteristics fit to the purpose of the study [29]. The educators selected were those who had been teaching mathematics courses for at least two years and had attended at least one training session on OBE.

A questionnaire containing true-false questions and open questions was created for use as research instruments. The questions were designed based on the concepts developed by OBE experts. These included papers by Spady [17], the CHED Handbook [3-6], a paper by Killen [8], papers by Biggs and Tang [3, 9] and Barr and Tag [27]. According to Schwartz, a true-false test requires one to recognize the correct statement of fact, or to identify beliefs [31]. This type of test was used to determine if the participants recognized what an outcomes-based approach was, and to identify their enthusiasm for OBE. The open questions, on the other hand, intended to validate the quantitative data, and to establish the in-depth views of the educators regarding OBE. The content validity of these tests was checked, reviewed, and improved by three experts. These experts were a dean for Academics of an institution adopting Outcomes-based Teacher Education Curriculum (OBTEC), a dean of College of Arts and Sciences (CAS), and a CHED Education Supervisor. The questionnaire was adapted based on the suggestions and comments of these experts. Then the instrument was pilot tested using a sample of thirty lecturers. Kuder-Richardson’s [21] theory was used to calculate the reliability coefficient for the true-false test. It was found to be 0.72 indicating that the questionnaire was reliable. The final questionnaire included ten items for each of the principles of OBE, and fourteen items for OBE learning theories. The open questions included questions to assess educators understanding of the meaning and essence of OBE, the definition of learning outcomes and its relationship to assessment and teaching-learning activities, the distinction of OBE from a traditional approach in various dimensions and the premises and principles of OBE.

Permission was sort from the head of each institution which it was hoped would be part of the research. Informed consent was then obtained from the target respondents. The questionnaire was given to the educators in person with two exceptions who responded

by email. The participants were given sufficient time to answer the questions in the questionnaire. Following the questionnaire completion each was informally interviewed regarding their answers. In addition to this semi-structured interviews were conducted with twenty of the participants. During this interview the premises and principles of OBE were explained to the participants. In the interviews participants were asked how they applied each premise or principle of OBE in their classes. The aim of these interviews was to enable the respondents to freely articulate their opinions, attitudes, and level of preference towards OBE. Following the interview their syllabi and test questions were captured using phone camera and were reviewed.

The quantitative data was statistically analyzed using frequency count and calculations of percentages and means. The qualitative data that was collected was analyzed for recurring topics. Fraenkel and Wallen [29] write that qualitative data may be categorized into topics. In this research the topics that were covered were the educators' understanding of OBE. The data was coded with symbols related to their common themes. To determine the quality of the educators' responses, criteria were set based on these themes.

The results were simultaneously gathered, compared, and analyzed. This was done to determine whether they validated one another and to establish how the educators understood and implemented OBE. The responses of the educators were assessed against OBE theory.

### 3. Results and Discussion

#### 3.1. Mission/Focal Point of OBE

Only forty-three percent of the participants correctly identified the focus of OBE. The majority of the participants believed that the focus of OBE is on the resources or inputs to the system such as quality instruction, development of resources, and the procedures and time needed for learning. They indicated these things as the focus of OBE because they can be used to improve learning. Spady [17] argues that successful learning only occurs when the focus of education is outcomes, not resources or processes. Spady [17] suggests that an education that focuses on inputs and process cannot guarantee that students are competent at the end of learning. If the competence required among students is not the focus then Spady [17] feels that it is unlikely to be achieved.

#### 3.2. Criteria for Success

Approximately half (52%) of the educators specified the criteria for success in OBE correctly. The participants believed that success in OBE is achieved when students are able to demonstrate the intended learning outcomes. The respondents felt that the criteria should include curriculum or program improvement and expansion, quality of resources, growth in

enrollment and revenue, quality of mathematics educators and mathematics instruction, and quality of students enrolled in the subject. They felt that when an institution had these inputs and means, there is already an assurance that the intended outcomes of education would be achieved.

Several sources in the literature say that success in OBE is achieved only when students are able to attain the desired outcomes of education. They do not state that this can be judged by the improvement of school resources nor procedures [6, 8, 17, 27]. CHED illustrates through Barr and Tagg's [27] article that inputs are the criteria for success in a teacher-centered or inputs-based education [6] but not in OBE.

#### 3.3. Teaching/Learning Structure

Three in every 10 of the participants had difficulty in identifying the OBE teaching-learning structure. 34% of the participants indicated that there was a defined time for learning of mathematics in OBE. Their institutions were oriented in such a way that the time stipulated in the syllabus must not be altered. This is so that all of the content will be covered and taught to students. In this way, they believe that students have more chance to succeed in OBE. This way of thinking, however, is not consistent with the OBE literature. This stipulates that when time is fixed, learning may vary and students may not succeed in their education [8, 32]. This is because students face a new lesson with new material which may require the understanding of previous concepts which they may not yet fully grasp. Some learners may not cope with the teaching pace. Barr and Tagg [27] state that in the outcomes-based paradigm, learning is held constant while time take to achieve the outcomes is alterable [6, p. 25].

Three in every 10 educators indicated that they gave rewards to their fast learners and consistent performers. They asserted that this strategy encouraged all students to study well. It is thought that this practice could discourage inclusionary success and cooperative learning which are key components of OBE [6, 9, 17]. Inclusionary success means that all students can succeed and be rewarded; while cooperative learning emphasizes that rather than competing with each other, all students should help one another to enhance their individual performances [17].

One in every five participants in the research indicated that they thought that lectures were not used in OBE. One respondent said that, "OBE is a learning process that uses new technique in teaching. In OBE, lecture should not be used." On the other hand, Powers [33] posits that teachers cannot get away without lectures because outcomes still involve understanding. However they (lectures) cannot be used most of the time because most outcomes require students to demonstrate what they know and understand [33].

**TrainingMatrix**

<b>Intended Learning Outcomes</b>	<b>Teaching Learning Activities</b>	<b>Output</b>
<i>Training Session 1: Instructional Practices in Outcome-based Education</i>		
The participants will be able to discuss and interpret OBE. They will be able to suggest ways to implement outcome-based approach in the teaching-learning process.	<ul style="list-style-type: none"> <li>● Discussion on OBE Premises and Principles</li> <li>● Brainstorming on how to develop an outcomes-based approach in various contexts</li> <li>● Group presentation of outputs regarding how to implement Outcomes-based approach in the instructional process.</li> </ul>	Compilation of various ways of implementing outcomes-based approach in the teaching-learning process.
<i>Training Session 2: Developing Outcomes-based Syllabi</i>		
The participants will be able to develop outcome-based Mathematics syllabi.	<ul style="list-style-type: none"> <li>● Discussion 1: Constructive Alignment</li> <li>● Discussion 2: CHED's policies and guidelines in developing syllabus</li> <li>● Discussion 3: How to write intended learning outcomes (ILOs)</li> <li>● Workshop 1: Writing ILOs</li> <li>● Discussion 4: Aligning the teaching-learning activities (TLAs) with the ILOs</li> <li>● Workshop 2: Organizing the TLAs</li> <li>● Discussion 5: Aligning the Assessment Tasks (ATs) and Performance Criteria with the ILOs</li> <li>● Workshop 3: Preparing the ATs with Performance indicators</li> <li>● Discussion 6: How to convert assessment tasks into grades</li> <li>● Workshop 4: Stating how the results of assessment tasks will be converted into grades</li> <li>● Discussion 7: Checking the alignment of ILOs, TLAs and ATs</li> <li>● Workshop 5: Presentation, Evaluation and Finalization of the Syllabi</li> </ul>	An outcome-based Mathematics syllabi that is ready to be published
<i>Training Session 3: Developing Outcome-based Assessment Tools</i>		
The participants will be able to create outcome-based assessment tools.	<ul style="list-style-type: none"> <li>● Discussion 1: Features of Outcome-based Assessment</li> <li>● Discussion 2: Principles of High Quality Assessment</li> <li>● Workshop 1: Reviewing the Course Syllabi and Constructing Table of Specifications (TOS)</li> <li>● Discussion 3: Specific Suggestions in Constructing Tests</li> <li>● Workshop 2: Writing Test Questions</li> <li>● Workshop 3: Requesting Feedback from co-participants, facilitators and trainers on the Test Questions</li> <li>● Workshop 4: Incorporating Important Suggestions on the Test Questions</li> <li>● Discussion 4: Principles in Developing Quality Rubrics</li> <li>● Workshop 5: Reviewing Performance Assessment in the Syllabi and Developing Rubrics</li> <li>● Workshop 6: Requesting Feedback from co-participants, facilitators and trainers on the rubrics</li> <li>● Workshop 7: Incorporating important suggestions on the rubrics</li> </ul>	Outcome-based assessment tools that are ready to be published

### 3.4. Assessment/Alignment

Forty-seven percent (47%) of the participants understood what outcomes-based assessment was. Some educators were familiar with constructive alignment. Constructive alignment is alignment between the teaching/learning activities and the assessment with the intended learning outcomes. However some of their responses contradicted this. The respondents were asked to give an example teaching-learning activity and assessment for the learning outcome “students are able to illustrate the graph of a quadratic function”. Some of the respondents suggested that the teaching could be about graphing quadratic functions while the “assessment could be a multiple choices such that students will choose from among choices the graph of a given quadratic function.” This response violates the constructive alignment that is necessary for OBE because while the instruction involves illustrating the graph of quadratic functions, the assessment does not require students to illustrate a quadratic function.

Approximately 40% of the educators believed that assessment is separate from teaching and is done only at the end of instruction. Powers [33] and CHED [6] pose that OBE uses both formative and summative assessments where learners are even assessed before and during instruction and not only after instruction.

In a similar finding it was found that the majority (64%) of respondents disagrees that a students’ record could be changed when an improved learning performance warrants it. They also disagreed that students’ achievement at the end of the learning period was the final result of all student prior learning, not the average of all the prior learning. It was found that some educators even included formative assessments such as seat works, activities, assignments, and short quizzes in their grading system. Likewise, 5% to 10% of some of their grading systems was allocated just for attendance and behavior.

In contrast to this the OBE method suggests that only student’s culminating achievement should serve as the ultimate basis in judging their performance [17]. In OBE, results of formative assessments are recorded but should not be graded [6]. This is because they are only thought of as a tool in monitoring learning progress. OBE also adheres to the principle that performance records should never permanent and these can be modified progressively as the students show improved learning performance through their education [17]. Likewise, OBE imposes performance credentialing not custodial credentialing. This means that students are only given performance credentials when they can clearly demonstrate all the necessary criteria that comprise the outcomes and not because they attend to class in a fixed period of time [17]. This suggests that attendance and behavior should never form any basis of student performance in OBE. OBE discourages grades in education but encourages educators

to focus on students’ skills instead.

### 3.5. Theories of Learning

Three in every five educators that took part in the research could identify theories supporting OBE. It was found, however, that some educators find it difficult to adopt and implement OBE theories. It was found that there were some educators who were not even in favor of the OBE premises that “all students can successfully learn in different ways and times”, and that “schools control the condition that directly affects successful student learning” [17]. This finding affirms the fact that slow learners cannot succeed in learning as they may give up before learning higher Mathematics. The respondents disagreed that students’ success depended on educators as they observed that the students themselves are a major factor of their own success.

Some educators also highlighted ideas that do not adhere to the OBE principles. One example, which violates the principle of constructive alignment and designing down, is their idea that content should be selected first and should serve as basis of constructing outcomes. Another is the understanding that high expectations as a principal of OBE simply mean that teachers should set high standards for students and that students should adapt to meet these standards. It is thought that this may result in the failure of students when the teacher does not desire students to succeed. Similarly, opposite of outcomes-based paradigm, is their opinion that OBE is time-defined and that students learn in a limited time.

Furthermore, the educators’ ideas regarding expanding students’ learning opportunities are mostly focused on using gadgets and employing motivations, group activities, and giving assignments. OBE, on the other hand, suggest that expanded learning opportunities are provided to students when the teaching learning time frequency, duration, and timing are expanded, varied instructional methodologies and modalities are used, the principles of OBE are consistently, systematically, creatively, and simultaneously applied; criterion-based assessment is utilized; and students have access to significant curriculum resources where curricular experiences are structured such that learning increases [8, 17, 30, 34].

### 3.6. Nature of Roles

Four in every 5 (or 82%) educators correctly identified that teachers in OBE are learning facilitators, mentors, learning environment designers, assessors, and work with staff and students in teams for the students’ achievement of outcomes. Hence, they agree that they are not the main source of information for students’ learning but they should motivate and engage all their students in the teaching-learning process.

A number of educators, on the other hand, thought that giving modules to students and having them answer questions, is an act of being facilitator and an

outcome-based approach that is not effective for students' learning. They argue then that OBE is not effective as they insist that serving as a learning facilitator for the whole teaching-learning process does not aid students' independent learning. On the other hand, they favor the content-focused curriculum in which they view teachers as both lecturers and learning facilitators. They believe that after their lecture, their students already know how to learn independently. During lecture observations some educators were seen to start by answering some problem examples on the board. Students are then required to solve similar to what has been done. In this case, they teach first through teacher-centered instruction before their students are engaged in the learning process.

Learning facilitation however, differs from how the educators were found to define it. Learning facilitation is a constructive process which aims to guide the students to demonstrate the outcomes even at the very first phase of the learning process. This is in order to increase the chance that all learners will be able to achieve the desired outcome at the end of instruction [35]. This process includes modeling actively successful techniques and behavior, continuously diagnosing and assessing ongoing student practice and performance, offering frequent and focused feedback, and intervening constructively in the learning process in a timely manner [17].

#### 4. Discussion

This study used mixed methods to determine Mathematics educators' perspectives about OBE. The investigation found that the educators find difficulty in adopting the OBE mission, criteria for success, teaching/learning structure, assessment, learning theories, and nature of roles. The areas within which they lack knowledge in implementing OBE bring challenges to the educational community and to their students. Their focus on inputs over outcomes may compromise students' success. This is particularly the case when these inputs do not guarantee learning opportunities and do not enable students to meet the desired learning competencies. Their lack of focus on outcomes corresponds to their non-outcome-based instructional processes. These area fixed time for instruction and employing quantitative assessment using scores. These methods lead to the use of a large amount of traditional teaching and assessments, as well as to methods of permanent scoring, recording and grading of assessment results and attendance. These findings may be associated with their resistance to change and their negative attitude to outcome-based systems. Such could be a critical problem with the adoption and implementation of OBE in higher education institutions in the Philippines.

The findings from this research do not support previous studies on OBE in the Philippines. Previ-

ous studies claimed that educators had a great extent of knowledge of OBE and its practice [13,36] It is thought that this could be due to the fact that educators can easily claim they are knowledgeable about OBE but its principals may not appear in practice. This suggests that there are large opportunities for improvement and to implement transformational outcome-based Mathematics education in the country. It is felt that this should start among Mathematics educators by equipping them with knowledge and understanding of OBE through revisiting the key theories, principles, and premises of OBE. A flexible and alterable curriculum is also needed. This should be an outcome-defined rather than a time-defined one [17, 28]. The assessment systems should also be changed from being quantitative using scores into qualitative ones using rubrics [9, 28, 30, 37]. HEIs should invest in enabling their Mathematics educators to implement outcome-based approaches to education by sending them to training sessions. They could organize training sessions with OBE experts and provide opportunities for them to benchmark their own performance against educators from institutions that have already adopted a transformational OBE.

In order to address the findings in this research, three outcome-based training programs were designed. These are shown in the Training Matrix which can be seen below. Training session 1, Instructional Practices in Outcomes-based Education, is intended to build up the educators' awareness understanding on OBE and to alter their negative thoughts and attitudes towards OBE. Training session 2, Developing Outcome-based Syllabi, assumes that the HEIs have already stated outcomes of significance from the institutional level down to the course level. The development of outcome-based syllabi is aimed at facilitating the implementation of outcome-based teaching-learning. Moreover, Training Session 3 entitled "Developing Outcomes-based Assessment Tools" aims to help the educators' in their application of outcome-based assessments.

##### 4.1. Scope and Limitations

The findings of this research are only applicable to the participants of the study at the time of the study. They may also be relevant to other comparable Mathematics educators in the Philippines and in other ASEAN countries. Few participants who took part in the research were not qualified teachers while some had only had limited education training provided by their respective institutions. Limited time meant that limited observations of teaching by the participants were carried out. For triangulation only the course syllabi and test questions were analyzed. Future studies should consider qualitative research designs and broad-based case study across all course areas to reveal how OBE is being implemented by HEIs. This should be used to offer opportunities for further curric-

ular improvement. After a period of OBE implementation, research should attempt to assess the impact of OBE on the educational community. A particular focus of this should be on the students.

## References

- [1] J. S. Hilario, Using outcomes-based education (OBE) in the teaching and learning of community and public health with related learning experience, *Asian Journal of Educational Research* 3(2015) 46–56.
- [2] A.D. Abad, ASEAN 2015: Philippine education's boon or bane?, 10th CODEB IV-A annual conference (2014).
- [3] CHED Memorandum Order (CMO) No. 46, Series of 2012. Policy Standards to Enhance Quality Assurance (QA) in Philippine Higher Education Through Outcomes-based and Typology-based QA. Available from: <http://www.ched.gov.ph/wp-content/uploads/2013/07/CMO-No.46-s2012.pdf>
- [4] Commission on Higher Education (CHED) Strategic Plan for 2011–2016. Available from: <https://ched.gov.ph/wp-content/uploads/2017/08/CHED-Strategic-Plan-2011-2016.pdf>
- [5] Guidelines for the Implementation of CMO 46 Series of 2012 on the Policy Standard to Enhance Quality Assurance (QA) in Philippine Higher Education through Outcomes-based and Typology-based QA. Available from: <https://ched.gov.ph/wp-content/uploads/2017/10/CMO-No.46-s2012.pdf>
- [6] Commission on Higher Education. Handbook on Typology, Outcomes-based Education, and Institutional Sustainable Assessment; 2014. Available from: <http://www.ched.gov.ph/wp-content/uploads/2014/06/Handbook%20on%20Typology%20Outcomes.pdf>
- [7] M. H. Davis, Outcomes-based education. *Journal of Veterinary Medical Education* 30 (2003) 227–232.
- [8] R. Killen, Outcomes-based education: Principles and possibilities. University of Newcastle, Faculty of Education; (2000).
- [9] J. Biggs, C. Tang, Teaching for quality learning at university. 3rd ed. Society for Research into Higher Education. McGraw-Hill (2007).
- [10] A. M. Morcke, T. Dorman, B. Eika, Outcome (competency) based education: an exploration of its origin, theoretical basis and empirical evidence. *Advances in Health Science Education* 18 (2013) 851–863.
- [11] A. C. Nicholson, Comparison of selected outcomes based on teaching strategies that promote active learning in nursing education. PhD (Doctor of Philosophy) Thesis, University of Iowa (2010).
- [12] M. J. Lawson, H. Williams, Outcomes-based education. Discussion Paper Prepared for the Association of Independent Schools of SA; (2007).
- [13] J. M. Laguador, C. I. Dotong, Knowledge versus practice on the outcomes-based education implementation of the Engineering Faculty Members in LPU. *International Journal of Academic Research in Progressive Education and Development* 3 (2014) 64–74.
- [14] B. Malan, The New Paradigm of Outcomes-based Education in Perspectives. *Tydskrif vir Verbruikerwetenskappe* 28 (2000) 22–28.
- [15] G. Lui, C. Shum, Outcome-based education and student learning in Managerial Accounting in Hong Kong. *Journal of Case Studies in Accreditation and Assessment* 2 (2012) 1–13.
- [16] I. L. An, Impact of Outcome-Based Education Instruction to Accountancy Students in an Asian University. *Asia Pacific Journal of Education, Arts and Sciences* 1 (2014) 48–52.
- [17] W. Spady, Outcome-based education: Critical issues and answers. Arlington, VA: American Association of School Administrators (1994) Available from: <https://files.eric.ed.gov/full-text/ED380910.pdf>
- [18] W. Spady, A. Schlebusch, Curriculum 2005: A Guide for Parents. Cape Town Renaissance; (1999).
- [19] M. B. Butler, Outcomes based/focused education overview, Education Department of Western Australia (2004). Available from <https://studylib.net/doc/5832739/outcomes-based-education-obe->
- [20] N. J. Ramoroka, Educators' understanding of the premises underpinning outcomes-based education and its impact in their classroom practices. University of Pretoria (2007). Available from: <http://www.archive.jfn.ac.lk/OBESCL/MOHE/OBE-Articles/Books-chapters-n-Reports/1.Assessment-n-QA.pdf>
- [21] C. Acharya, Outcome-based education (OBE): A new paradigm for learning, Triannual Newsletter produced by the Centre for Development of Teaching and Learning 7 (2003).
- [22] W. Spady, K. J. Marshall, Beyond traditional outcomes-based education. *Educational Leadership* 49 (1991) 67–72.
- [23] R. Berlach, Outcomes-based education and the death of knowledge. Conference of the Australian Association for Research in Education. The University of Melbourne, Victoria, Australia. Available from: <http://www.aare.Edu.au/04pap/ber04768.pdf>
- [24] D. N. Wijayanti, Cognitivism theory of language teaching and learning [Internet]. Mydreamarea; 2003 [cited 16 January 2018]. Available from: <https://mydreamarea.wordpress.com/2013/01/05/cognitivism-theory-of-language-teaching-and-learning/>
- [25] SEI-DOST, MATHTED. Framework for Philippine mathematics teacher education. Manila: SEI-DOST, MATHTED; 2011 Available from: [http://www.sei.dost.gov.ph/images/downloads/publ/sei\\_mathteach.pdf](http://www.sei.dost.gov.ph/images/downloads/publ/sei_mathteach.pdf)
- [26] P. Norman, Outcomes-based education: A PNG perspective. *Contemporary PNG Studies: DWU Research Journal* 5 (2006) 45–57.
- [27] R. B. Barr, J. Tagg, From teaching to learning: A new paradigm for undergraduate education. *Change* (1995) 12–25. Available from <http://docushare3.dcc.edu/docushare/dsweb/Get/Version-3000/BarTagg.pdf>
- [28] J. D. Dagdag, R. S. Cardona, Perspectives and practices on outcomes-based assessment (OBA) among College Mathematics Educators in Northeastern Luzon Philippines, *Asia Pacific Journal of Multidisciplinary Research* 6 (2018) 18–25.
- [29] J. R. Fraenkel, N. E. Wallen, How to design and evaluate research in education (7th ed). McGraw-Hill Higher Education. New York (2009).
- [30] J. Biggs, C. Tang, Applying constructive alignment to outcomes-based teaching and learning (2009).
- [31] M. Schwartz, Matching assessments to learning outcomes, The Learning & Teaching Office. Available from: <https://www.ryerson.ca/content/dam/lt/resources/handouts/examslearningoutcomes.pdf>
- [32] J. B. Caroll, The Caroll Model: A 25-Year Retrospective and Prospective View. *Educational Researcher* 18(1989) 26–31.
- [33] J. H. Powers, Converting class syllabi to outcomes-based teaching and learning format. Communication Studies Department, Hong Kong Baptist University (2008). Available from <http://qacaudit.hkbu.edu.hk/doc/Converting%20Syllabi%20to%20OBTL.pdf>
- [34] Hanover Research. Impact of school start time on student learning (2013). Retrieved from [https://www.shorewood.k12.wi.us/uploaded/Family\\_Resources/general/Impact\\_of\\_School\\_Start\\_Time.pdf](https://www.shorewood.k12.wi.us/uploaded/Family_Resources/general/Impact_of_School_Start_Time.pdf)
- [35] S. M. Davis, Becoming a learning facilitator. FacilitatorU.com (2011). Retrieved from <https://www.facilitatoru.com/data/guides/learningfacilitationguide.pdf>
- [36] M. F. De Guzman, D. C. Edano, Z. D. Umayam, Understanding the essence of the outcomes-based education (OBE) and knowledge of its implementation in a technological university in the Philippines. *Asia Pacific Journal of Multidisciplinary Research* 5 (2017) 64–71.
- [37] J. B. Biggs, Enhancing teaching through constructive alignment. *Higher Education* 32 (1996) 1–18.