ISSN: 2278-4012, Volume:8, Issue:2, APRIL 2019

DEVELOPMENT AND VALIDATION OF OUTCOME-BASED INSTRUCTIONAL MATERIALS (OBIMs) IN MATHEMATICS 2

Alia Adrienne A.Callanta[1], Ariel U. Cubillas[2] Lemgen O. Engente[3], and Renalyn L. Liones[4]
College of Education, Caraga State University, Ampayon, Butuan City

Abstract

This study aimed to develop and validate Outcome-Based Instructional Materials (OBIMs) in Mathematics 2. Anent to this, the researchers determined the least-learned skill in the first quarter periodic test of Grade 2 pupils. It was made as basis in crafting and designing the Outcome-Based Instructional Materials. The researchers used descriptive-developmental design where purposive sampling was utilized since the participants of the study were chosen based on the criteria set. There were six (6) participants who evaluated the content of OBIMs. The research instruments used in the study were survey questionnaires which underwent validation by experts. They were the tools used in the validation of the content of the OBIMs. The data gathered from the survey questionnaire were treated using weighted mean for analysis. Results revealed that the content of the developed OBIMs was valid meaning its objectives, technical quality, organization or flow of the activities, language arts content and alignment to the K-12 curriculum are very satisfactory. The results further suggest that the OBIM is suitable and appropriate for the pupils to master the competency in Mathematics 2.

Keywords: *Development, Validation, OBIM, Content Validation*

Introduction

Outcome-based Education (OBE) means focusing and organising a school's entire programs and instructional efforts around the clearly defined outcomes one wants all students to demonstrate when they leave school." (Spady, 1993) as cited in Education University of Hong Kong (2019). It affirms teachers as facilitators, rather than lecturers. Moreover, in OBE, teachers guide students through learning with scaffolded and hands-on activities to support student engagement with new material and encourage the application of developing knowledge and skills **(**Rubicon West LLC, 2016).

The teacher uses and applies the different kinds of instructional materials in teaching and absolutely it provides great advantages to the teaching-learning process. According to Ogaga (2016), instructional materials facilitate teaching and learning activities and consequently, the attainment of lesson objectives. Moreover, Ajoke (2017), stated on a study that the success of

ISSN: 2278-4012, Volume:8, Issue:2, APRIL 2019

achieving what they are met to achieve in an instructional situation depends on the suitability of the instructional materials, adequacy and effective utilization of the materials.

In addition, Olawale (2013), found that the instructional technology and instructional media introduced in Nigerian Educational System view of promoting effective teaching and learning. Teachers should necessarily choose or improvise conveyable instructional materials or aids to facilitate teaching and learning effectively and motivate their students. One of those is the availability, accessibility, and suitability of the instructional materials. The teacher must ensure that the instructional materials to be used must be easily available and it is also a duty of the teacher to ensure that it is also accessible before the date of used. The teacher must also ensure the appropriateness of the materials. Essential and meaningful materials for them are their needs that can motivate and make them love to their studies.

Albarico (2014), emphasized that instructional materials really helped to carry out the achievement by engaging the learners interactive learning considering the varied interest, abilities and maturity levels of the learners. The use of instructional materials assures and provides the students with different learning aids to maximize learning and retain the information given to them. The purpose of this is to align the students understanding with the topic with current knowledge.

The Outcome-based Education recognized the vital role of the instructional materials in the educative process. Thus, in order to achieve the aim of OBE, suitable and appropriate instructional materials must be created to correspond to the different ways of learning and must be used by teachers to facilitate effective teaching and better quality of education.

Theoretical and Conceptual Framework

This study is anchored on the Constructivist Theory of Jean Piaget and Jerome Bruner which stated that effective teaching depends on how the learners and teachers engage to an active environment that portrays learning. It asserts that learning through own experiences can motivate the learners to actively engage in classroom activities. Constructivists believe on the idea that learners make their own meaning in relation to their own ideas and experiences which encourage them to learn more and boost their motivation to engage in learning. In learning through constructivism way, the learner should make sense of things and should not receive information by imitating the phrasing of others. Instead, learners are advised to internalize and reshape information transformation through active observation (Faryadi, 2009).

Moreover, in the constructivist theory, learners have better performance and classes are more effective compared to the traditional classroom. It also clearly describes that lessons to be taught will be more engaging, more responsive and more effective (Bada, 2015). Skills, knowledge, abilities and attitudes are constructed by the learners in more meaningful and

ISSN: 2278-4012, Volume:8, Issue:2, APRIL 2019

relevant ways since they connect to their daily lives, experiences, real-life scenarios and workplace. It involves learners to deal new ideas that are indigenized and locally produced in their environment that can effectively connect to their lessons and different areas of subject matter.

Methodology

This study utilized the descriptive-developmental research design. It is descriptive because it identified the least-developed skill. It is developmental since the researchers crafted instructional materials from the least developed skill determined from the first quarterly assessment. The developed instructional materials used 4A's format namely Activity, Analysis, Abstraction, and Application and were crafted through contextualized, localized, and indigenized instruction. Questionnaires were used as primary source of data. There were six (6) elementary teachers chosen to validate the developed instructional materials. They were chosen since they acquired experiences in teaching elementary pupils which made them competent to validate the instructional materials. The study used the non-probability sampling specifically the purposive sampling. It is purposive since only teachers who were experts in validating instructional materials were selected as participants of the study. The questionnaire used in the study were adopted from the content expert material evaluation sheet from the study of Cubillas, T. (2018) entitled *The Development and Validation of Strategic Intervention Materials (SIM's) in Teaching Elementary in English 4- Content Validation.* The adopted content expert material evaluation sheet was the main research instrument used for gathering the data from the set of participants. The comments and suggestions of the participants were considered in the changes made in the instructional materials.

The data obtained from the questionnaires were processed to determine if the developed instructional materials still needs improvement, poor, fair, satisfactory or very satisfactory. The data collected were compiled, sorted out, organized, tabulated and subjected to statistical treatment to simplify the presentation, analysis and interpretation. Weighted mean was used to determine the average rating per item and overall mean rating given by the participants on the Outcome-Based Instructional Materials (OBIMs).

Findings

Problem 1. Least-Developed Skill of the Pupils in the First Quarter

Table 3 displayed the highlighted number item that got the least number of correct answers in quarterly examination. The learning competency about visualizing, representing, and adding 2-digit by 3-digit numbers with the sums up to 1000 without and with regrouping (Code M2NS-lg-27.4) was the least-developed skill in mathematics for the first quarter with a percentage of 42.5%. The class has 40 pupils in all which was the basis in computing for the percentage.

ISSN: 2278-4012, Volume:8, Issue:2, APRIL 2019

Table: 3 Item analysis in Mathematics 2

Item Number	Competencies	No. of Pupils Got the Correct Answers	Percentage (%)
1 and 2	visualizes and represents numbers from 0-1000 with emphasis on numbers 101 – 1 000 using a variety of	31 and 34	81.25
3	groups objects in ones, tens, and hundreds	29	72.50
4 and 5	gives the place value and finds the value of a digit in three-digit numbers	28 and 35	78.75
6	visualizes and counts numbers by 10s, 50s, and 100s	39	97.50
7	groups objects in ones, tens, and hundreds	29	72.50
8	reads and writes numbers up to 1 000 in symbols and in words	18	45.00
9	visualizes and writes three-digit numbers in expanded form	20	50.00
10, 11, 12	visualizes and compares numbers up to 1 000 using relation symbols	28, 29, 31	73.33
13	visualizes and orders numbers up to 1 000 in increasing or decreasing order	23	57.50
14 and 15	reads and writes ordinal numbers from 1st through the 20^{th}	32, 18	62.50
16	identifies and uses the pattern of naming ordinal numbers from 1st to the 20^{th}	31	77.50
17, 18,19	reads and writes money in symbols and in words through PhP100	32, 34, 23	74.16
20	compares values of different denominations of coins and paper bills through PhP100 using relation symbols	34	85.00
21 and 22	illustrates the properties of addition (commutative, associative, identity)	31, 33	80.00
23	illustrates the properties of addition (commutative, associative, identity)	35	87.50
24 and 25	adds 2-digit by 3-digit numbers with sums up to 1000 without and with regrouping	22, 18	50.00
26	***visualizes, represents, and adds 2-digit by 3-digit numbers with sums up to 1000 without and with regrouping***	***17***	***42.50***
27	visualizes, represents, and adds 3-digit by 3-digit numbers with sums up to 1000 without and with regrouping	36	90.00
28, 29, 30	addition of whole numbers including money with sums up to 1000 using appropriate problem solving strategies and	22, 19, 21	51.66

Problem 2. Outcome-Based Instructional Materials in Teaching Mathematics 2 Developed to Master the Least-Developed Skill

The consolidated item analyses in Mathematics 2 were the basis in identifying the least-learned skill and served as the foundation of developing the Outcome-Based Instructional Materials (OBIMs). The developed material is entitled ***"Sumada sa Duha ug Tulo ka Numero"*** (Adding 2

ISSN: 2278-4012, Volume:8, Issue:2, APRIL 2019

digit by 3 digit numbers). The researchers developed the instructional materials from the first quarter test of Mathematics 2. The construction of the instructional materials was anchored on the constructivist theory of Jean Piaget and Jerome Bruner. The content of the OBIMs was validated by the select elementary teachers.

Problem 3. Content Validity of the Outcome-Based Instructional Materials (OBIMs)

Table: 4
Content Validity of Outcome-Based Instructional Materials (OBIMs) in terms of objectives

INDICATORS	Mean	VD
A. Objectives		
1. Learning objectives are specific, measurable, attainable, and realistic and time bounded or SMART.	4.83	VS
2. Learning objectives suit the competency specified in the curriculum.	5	VS
3. Learning objectives are based on actual needs.	4.83	VS
TOTAL	**4.88**	**VS**

Range of Means: 1.00-1.33= Needs Improvement, 1.34-2.33= Poor, 2.34-3.33=Fair, 3.34-4.44= Satisfactory, 4.34-5.00= Very Satisfactory

It is shown in table 4, that indicator "the learning objectives suit the competency specified in the curriculum" got the highest mean of 5.00 which means very satisfactory. As a whole, the content validity of OBIMs in terms of objectives has a mean of 4.88 which means very satisfactory. The results signified that the OBIMs in terms of objectives are aligned to the learning standards of the Grade 2 learning competencies. The results were in accordance to O'Reilly, Lisa, MA. (2007), who stated that specific goals, or *learning objectives* are brief statements about what students, will be able to *do* when they complete instruction. Philosopher Seneca That mentioned, "If one does not know to which port one is sailing, no wind is favorable." It simply means that when you know where you are headed, you can more easily get there. Well-defined and articulated learning objectives are important because they provide students with a clear purpose to focus their learning efforts, direct choice of instructional activities and guide the assessment strategies.

Table: 5
Content Validity of Outcome-Based Instructional Materials (OBIMs) in terms of technical quality

INDICATORS	Mean	VD
B. TECHNICAL QUALITY		
1. Graphics and colors are appropriately used.	4.83	VS
2. The texts/words in the material are printed clearly, legibly, and written is in size that is a suitable for the pupils.	4.66	VS
3. The paper material used is clean and free from blots and other mess.	4.83	VS
Mean	**4.77**	**VS**

Range of Means: 1.00-1.33= Needs Improvement (NI), 1.34-2.33= Poor (P), 2.34-3.33=Fair (F), 3.34-4.44= Satisfactory (S), 4.34-5.00= Very Satisfactory (VS)

ISSN: 2278-4012, Volume:8, Issue:2, APRIL 2019

As revealed in table 5, indicators "the graphics and colors are appropriately used" and "the paper material used is clean and free from blots and other mess" got an equal mean of 4.83 as the highest. In total, the content validity of the OBIMs in terms of its technical quality has a mean of 4.77 described as very satisfactory. The results signified that the OBIMs in terms of technical quality can be used as Grade 2 teacher-support materials in teaching to master the competencies of Grade 2.

Graphic Design Institute in Delhi (2018) emphasized that if graphics and colors are appropriately used, it helps a lot in communicating the message behind the design to a large extent because it draws attention and guides the eye and gives a direction to your design. Every color conveys a different meaning. Thus, choosing the correct color is a big task. One has to use them in the design with purpose and meaning to make it better and meaningful. Same with graphics meanwhile it plays a major role in emphasizing and clarifying results and data. Good graphics can aid the reader's comprehension of the text and can convey trends, comparisons, and relationships more clearly than text and summarize the data by reducing it to a manageable size for presentation.

In addition, as instructed by Linde (2018), the paper materials must be in clean and free from blots or other mess to make it presentable and productive. Teachers should have good quality instructional materials to provide an effective instruction. Instructional materials are assets which teachers use to teach students.

Table: 6
Content Validity of Outcome-Based Instructional Materials (OBIMs) in terms of instructional quality

INDICATORS	Mean	VD
C. INSTRUCTIONAL QUALITY		
1. Directions are clear and properly laid out.	4.66	VS
2. The material is adequate to master the competencies and reinforce learning.	4.5	VS
3. Instructions are integrated with the pupil's prior knowledge or schema.	4.5	VS
4. The different parts of material provide varied activities for the learners.	4.83	VS
5. Each activity in the material encourages pupils to proceed to the next task.	4.83	VS
MEAN	**4.66**	**VS**

Range of Means: 1.00-1.33= Needs Improvement (NI), 1.34-2.33= Poor (P), 2.34-3.33=Fair (F), 3.34-4.44= Satisfactory (S), 4.34-5.00= Very Satisfactory (VS)

As gleaned in Table 6, the indicators which stated that the different parts of material provide varied activities for the learners and each activity in the material encourages pupils to proceed to the next task got the highest mean of 4.83 which means very satisfactory. As a whole, the content validity of the OBIMs in terms of instructional quality has a mean of 4.66 described as

ISSN: 2278-4012, Volume:8, Issue:2, APRIL 2019

very satisfactory. The results indicated that the OBIMs in terms of instructional quality has good quality information that fairly represents what pupils know and what they can do and can facilitate preparedness of the teachers to innovate classroom management. In connection to this result, Hilberg S, et al. (2003) stated in their study entitled *Designing Effective Activity Centers for Diverse Learners* that the goal line of reordering a classroom into activity hub is to allow the teacher to provide the highest quality instruction to a small group of students, while other students work productively, independently, and cooperatively in a variety of interconnected tasks at other activity center.

Table: 7
Content Validity of Outcome-Based Instructional Materials (OBIMs) in terms of organization

INDICATORS	Mean	VD
D. ORGANIZATION		
1. Sequence of the activities in the material achieves its defined purpose.	4.66	VS
2. The material follows the suggested parts or OBIMs.	4.66	VS
3. The OBIMs include the lessons which are congruent to the objectives listed in the instructional material.	4.66	VS
4. The activity given aids the pupils' understanding about the topic or lesson.	4.83	VS
5. The assessment enhances pupils' understanding about the topic or lesson.	4.83	VS
6. The problem given aids pupils' understanding about the topic or lesson.	4.83	VS
7. Level of difficulty is appropriate for the pupils' learning capability.	5.00	VS
8. The material effectively stimulates pupil's creativity.	4.66	VS
9. The activities in the material are enjoyable, stimulating, challenging and engaging.	4.66	VS
10. The material provides balanced assessment type questions.	4.33	VS
11. The activity given aids the pupils' understanding about the topic or lesson.	4.67	VS
MEAN	**4.71**	**VS**

Range of Means: 1.00-1.33= Needs Improvement (NI), 1.34-2.33= Poor (P), 2.34-3.33=Fair (F), 3.34-4.44= Satisfactory (S), 4.34-5.00= Very Satisfactory (VS)

As displayed in table 7, the indicator which states that the level of difficulty is appropriate for the pupils' learning capability got the highest mean of 5.00 described as very satisfactory. As a whole, the content validity of the OBIMs in terms of organization has a mean of 4.71 interpreted as very satisfactory. The results implicated that the OBIMs in terms of organization are appropriately organized based on content standards and the sequence of contents ensures mastery in learning the competencies of Grade 2. This claim is supported by Blazar, D, et al. (2016), who explained that an appropriate level of curriculum and reasonable expectations to suit the capabilities of the students should be provided by the school, so as to motivate the learners to engage in the process of learning. Aside from providing the common needs and individual differences of the students, teachers should also be careful in adjusting their expectations of students.

ISSN: 2278-4012, Volume:8, Issue:2, APRIL 2019

Table: 8
Content Validity of Outcome-Based Instructional Materials (OBIMs) in terms of language arts content

INDICATORS	Mean	VD
E. LANGUAGE ARTS CONTENT		
1. The material focuses on the knowledge, Skills and Attitudes (KSAs) appropriate to the grade level	5	VS
2. Lessons/tasks are integrated (may contain one, both or all macro skills in Mother Tongue) when appropriate.	4.66	VS
3. The material adheres to the text complexity of the grade level outlined by K to 12 Mother Tongue competencies.	4.83	VS
4. Activities in the material promote positive values that support formative growth.	4.83	VS
5. Activities are meaningful and substantial.	4.66	VS
6. Range and quality of text in the material are addressed with a well- balanced representation of literary and informational texts.	4.83	VS
7. The material includes application of skills and concepts in mother tongue.		
MEAN	**4.78**	**VS**

Range of Means: 1.00-1.33= Needs Improvement (NI), 1.34-2.33= Poor (P), 2.34-3.33=Fair (F), 3.34-4.44= Satisfactory (S), 4.34-5.00= Very Satisfactory (VS)

As presented in table 8, the indicator "the material focuses on the knowledge, Skills and Attitudes (KSAs) appropriate to the grade level" got the highest mean of 5.00 which means very satisfactory. All in all, the content validity of the OBIMs in terms of language art content has a mean of 4.78 described as very satisfactory. The results signified that the OBIMs in terms of language art content is significant since it becomes the means of developing cognitive, affective or psychomotor skills of the learner and it addresses the cultural context needs of the learners in Grade 2. This claim is supported by the Department of Education or the (2009) which recognized the benefits of teaching children using the mother tongue or first language. Local and international research has found that the children learn to speak read and write more quickly in their first language, and can pick up a second and third language more easily it taught in their first language. In the same way, they acquire other academics competencies more quickly, particularly in Science and Math.

Table: 9
Content Validity of Outcome-Based Instructional Materials (OBIMs) in terms of alignment

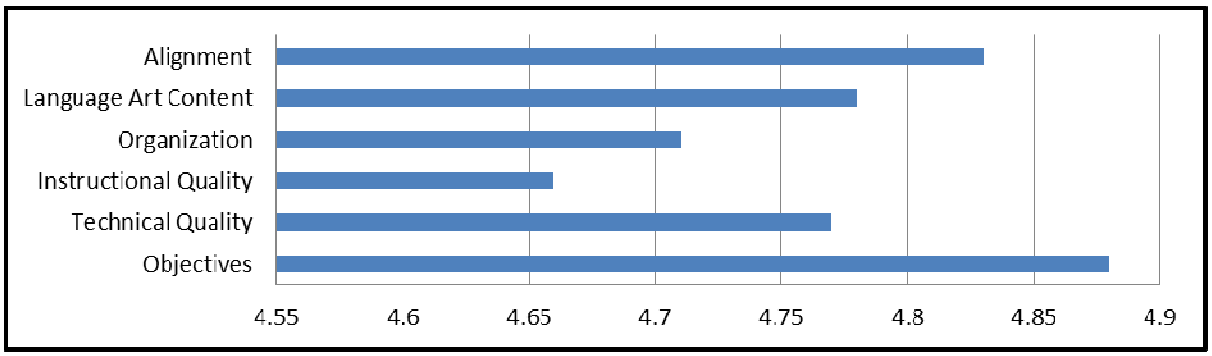
INDICATORS	Mean	VD
F. ALIGNMENT		
1. The material content aligns to the curriculum.	5	VS
2. The material is useful resource in preparing students to meet the requirements of the curriculum standards.	4.83	VS
3. Activities have purpose, and are aligned to a skill or concept of the grade level.	4.83	VS
4. Tasks are aligned to anchor standards in teaching Mother Tongue.	4.66	VS
MEAN	**4.83**	**VS**

Range of Means: 1.00-1.33= Needs Improvement (NI), 1.34-2.33= Poor (P), 2.34-3.33=Fair (F), 3.34-4.44= Satisfactory (S), 4.34-5.00= Very Satisfactory (VS)

It is displayed in table 9 that indicator "the material content aligns to the curriculum" got the highest mean of 5.00 which means very satisfactory. As a whole, the content validity of the

ISSN: 2278-4012, Volume:8, Issue:2, APRIL 2019

OBIMs in terms of alignment has a mean of 4.83 described as very satisfactory. The results implied that the OBIMs in terms of alignment are good, measurable and capable to use in teaching and are aligned to the K-12 curriculum in Grade 2. In relation to this result, an article entitled "Important to Align Instruction and Assessment"(1997), specified that when instructional material is aligned with instruction, students and teachers are both benefited. More likely the students learn because instruction is focused and because they are assessed on what they are taught.



Range of Means: 1.00-1.33= Needs Improvement (NI), 1.34-2.33= Poor (P), 2.34-3.33=Fair (F), 3.34-4.44= Satisfactory (S), 4.34-5.00= Very Satisfactory (VS)

Fig. 2 Summary of Means of the Content Validity

Figure 2 shows the overall mean of the content validity criteria. The highest indicator which is the Objectives got the highest mean of 4.88 while the lowest indicator which is the Instructional Quality got the mean of 4.66. As a whole, the OBIMs rated by the experts is very satisfactory or the material is very appropriate to be used in the teaching and learning process in Math Grade 2.

Conclusions

The objectives of the developed OBIMs are aligned to the learning standards of the Grade 2 learning competencies and their technical quality are suitable and appropriate to be used as Grade 2 teacher-support materials to master the competencies of Grade 2.

The developed OBIMs has good quality information that fairly represents what pupils know and what they can do and can facilitate preparedness of the teachers to innovate classroom management. Furthermore, the content organization of the OBIMs are appropriately organized based on the content standards and the sequence of contents ensures mastery in learning the competencies of Grade 2.

The language art content is significant since it becomes the means of developing cognitive, affective or psychomotor skills of the learner to address the cultural context needs of the learners

in Grade 2. Lastly, the OBIMs in terms of alignment are good, measurable and capable to be used in teaching and are aligned to the K-12 curriculum in Grade 2.

References

Agustin, J. et al. (2018). Development and Validation of a Strategic Intervention Material (SIM) in Teaching Mother Tongue Based-Multilingual Education (MTB-MLE) In Grade 3.

Ajoke, Alabere Rabiat (2017). The Importance of Instructional Materials in Teaching English as a Second Language. Retrieved from http://www.ijhssi.org/papers/v6(9)/Version-3/F0609033644.pdf on February 2, 2018.

Albarico, S., et al. (2014). Adequacy if Instructional Materials Used by Teachers in Teaching Technology and Livelihood Education. Retrieved from https://docplayer.net/15780436-Adequacy-of-instructional-materials-used-by-teachers-in-teaching-technology-and-livelihood-education.html on February 2, 2018.

Amboy, et al. (2018). Development and Validation of Strategic Intervention Materials (SIM) in Teaching Elementary English in a Combination Class.

Blazar, D, et al. (2016). Teacher and Teaching Effects on Students' Attitudes and Behaviors. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5602565/ on November 20, 2018.

Constructivism and the Construction of Knowledge. Retrieved from: https://www.researchgate.net/publication/242566312_Constructivism_and_the_Construction_of_Knowledge on April 25, 2018.

Cubillas, T. (2018) Development and Validation of Strategic Intervention Materials (SIMs) in Teaching Elementary English 4-Content Validation. Retrieved from https://www.journalijdr.com/development-and-validation-strategic-intervention-materials-sims-teaching-elementary-english-4 on October 18, 2018.

Education University of Hong Kong (2019). Outcome-Based Learning Project. Retrieved from https://www.eduhk.hk/flanobl/view.php?secid=784 on February 8, 2019.

Encyclopedia. Retrieved from www.encyclopedia.com on February 22, 2018.

Graphic Design Institute in Delhi (2018). Retrieved from http://graphicdesigninginstituteindelhi.blogspot.in/2018/01/importance-of-colors-in-design.html on November 20, 2018.

Hilberg. S, et al. (2003). Designing Effective Activity Centers for Diverse Learners, A Guide For Teachers At All Grade Levels And For All Subject Areas. Retrieved from http://manoa.hawaii.edu/coe/crede/wp-content/uploads/Hilberg_et_al_20031.pdf on November 20, 2018.

Important to Align Instruction and Assessment. Retrieved from https://www.eduplace.com/rdg/res/litass/align.html on November 20, 2018.

Jammang, R. et al. (2017). Development and Validation of Environment Based Instructional Materials in Science 4.

Linde, Sharon (2018). Instructional Planning: Quality Materials & Strategies. Retrieved from https://study.com/academy/lesson/instructional-planning-quality-materials-strategies.html on November 20, 2018.

O'Reilly, Lisa, MA (2007). Assessment and Instructional Alignment. Retrieved from http://www.ucdenver.edu/faculty_staff/faculty/center-for-faculty-development/Documents/tutorials/Assessment/index.htm on November 20, 2018.

Ogaga, G.A., Ogori Wallace and Egbodo Benson. (2016). Effects Of Instructional Materials On The Teaching and Learning Of Social Studies In Secondary Schools On Oju Local Government Area Of Benue State. Retrieved from http://www.journalcra.com/article/effects-instructional-materials-teaching-and-learning-social-studies-secondary-schools-oju-l on February 23, 2018.

Olawale, Sulaimain Kamal-deen (2013), The Use of Instructional Materials for Effective Learning of Islamic Studies. Retrieved on February 1, 2018.

Rubicon West LLC (2016).Outcome-Based Education Planning for Learning Design. Retrieved from https://www.rubicon.com/outcome-based-education-planning/ on February 8, 2019.

Spring (2010). Realia and Contextualization. Retrieved on February 2, 2018. Retrieved from http://apjeas.apjmr.com/wp-content/uploads/2017/05/APJEAS-20