Design, development and evaluation of contextualised learning materials in consumer electronics

Ramil B. Arante*, Cabadbaran Campus, Caraga State University, Barangay 11, Cabadbaran 8605, Philippines
Mary Rose Sacay, Cabadbaran Campus, Caraga State University, Barangay 11, Cabadbaran 8605, Philippines
Vivialyn Bocboc, Cabadbaran Campus, Caraga State University, Barangay 11, Cabadbaran 8605, Philippines
Dainty Bianca Baisa, Cabadbaran Campus, Caraga State University, Barangay 11, Cabadbaran 8605, Philippines

Abstract

This study aimed to design and develop a learning material in consumer electronics servicing (LM-CES) for grade 7 technology and livelihood education (TLE) for La Union National High School, Cabadbaran City, Philippines, and to address the problem of scarcity of instructional materials. Using the developmental research design, the LM-CES followed the analysis, design, develop, implement and evaluate model. The participants of the study are limited to the teacher education students of Caraga State University Cabadbaran Campus who provided essential comments and ratings of the learning material (LM) by using a given rubric and faculty members who are experts in the field due to the threat of the global pandemic. It has also undergone teaching demonstration evaluation for its content, organisation/clarity, completeness, grammar/mechanics, documentation, delivery and interaction. The overall rating from the peer evaluators was 2.99 with a descriptive rating of satisfactory or proficient. It implies that the researchers still need to enhance the lesson towards its completeness in order to attain its objectives. To further enhance LM-CES, a test run of the LM on its target end users in the actual classroom setting as well as an evaluation by some TLE teachers, who are also experts in teaching the subject, are hereby recommended.

Keywords: Contextualised, design, development, evaluation, instructional materials, learning materials.

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* ADDRESS FOR CORRESPONDENCE: **Ramil B. Arante**, Cabadbaran Campus, Barangay 11, Cabadbaran 8605, Philippines.
E-mail address: rbarante@carsu.edu.ph / ramilarante69@yahoo.com / Tel.: +63-917-711-0034

1. Introduction

Most of the research about the teaching and learning process points out to the need to make use of instructional materials (IMs) in schools to produce better results in the teaching–learning process. IMs are tools used by the teacher in the teaching–learning process to make the learning objectives clearer and teaching easier. Absence and insufficiency of learning materials (LMs) are main reasons for the futility of the educational system and subpar performance of learners in the school (Abdu-Raheem, 2011). Its effects in education are on a large scale, especially in quality and standards.

In addition, Arante (2018) in his study emphasises the dependence of quality education on the availability of instructional equipment and devices in various learning institutions, which is believed to play a vital role in the hands-on training of students. He further stated that: 'funding is limited because of the recent economic crisis that the Philippine government is facing. So, the need for providing all schools with sufficient instructional equipment and devices is a problem yet unsolved. In years, faculty members and students tried to maximise the use of facilities and equipment in the laboratories that are deficient in number and quality, much more, are obsolete. To address this problem, a technician-instructor should resort to his ingenuity, potentiality, and creativity to the fullest extent possible in order to acquire less expensive but equally effective instructional devices that may facilitate instruction.'

It has been almost 6 years since the former President Benigno Simeon Aquino III signed the Enhanced Basic Education Act or also known as the K–12 Curriculum. But at that time, it was not totally embraced by the people. Its impact was noticed by the start of the year 2015–2016 because it was the start of the senior high school. Nowadays, public schools are slowly acknowledging the importance of the K–12 Curriculum with the hope of the first two batches of the senior high school graduates will be a success. But even with such popularity, the insufficiency of LMs is still haunting the teachers and the learners as well. The teachers who are acting as facilitators are having a dilemma finding LMs that they need. Even if the Department of Education provides online material resources, it is not enough.

During the consultation, initiated by the researchers and the administrator of La Union National High School which serves as needs assessment, they identified that IMs are one of the weaknesses of their technology and livelihood education (TLE) teachers. This is a major problem that needs to be solved. To address this problem, the researchers intend to design and develop IMs for the exploratory courses of consumer electronics. It is envisioned that after the development of these LMs, it will somehow ease their problem of not having appropriate LMs.

1.1. Objectives of the study

The study is guided by the following research objectives:

- design an IMs for Consumer Electronics Servicing Exploratory Courses for Grade 7 in La Union National High School;
- develop a prototype of the above LM; and
- determine the extent of the participants' preliminary evaluation of the developed LM.

2. Conceptual framework

The analysis, design, development, implement and evaluate (ADDIE) model is a model of the instructional system design (ISD) family (n.d.). This model is an iterative instructional design process, where the results of the formative evaluation of each phase may lead the instructional designer back to any previous phase. The ADDIE model first appeared in 1975. It was created by the Centre for Educational Technology at Florida State University for the U.S. Army and then was quickly adopted by all the U.S. Armed Forces (Branson, Rayner, Cox, Furman, King & Hannum, 1975; Watson, 1981).

Figure 1. The flow of the development and evaluation of IMs based on the ADDIE model.
Adopted from Steven J. McGriff

The ADDIE model was paired with the four A's format in the development of the materials. The four A's stands for activity, analysis, abstraction and application.

- Activity – this is the stage where the student's prior knowledge is shown. In this stage, the topic or lesson is being introduced to the students for them to know what they will learn throughout the activity.
- Analysis – this is where a more thorough understanding of the lesson is being learned. The teacher will act as a facilitator rather than a lecturer. This is where the students have an in-depth understanding of the lesson.
- Abstraction – this is the stage where the lesson presentation is being focused and more questions lead the students in reinforcing what they know and should know. The importance of the lesson to the lives of the students is realised in this stage.
- Application – this is the last part of the four A's where the students will perform the hands-on activity to bring the students to a more practical way of using what they have learned and thinking of new ways on how it can be improved further.

In lessons development, the researchers change the label for each stage to make it easy to understand what that certain stage is all about. Instead of using the usual labelling, the researchers change Activity to exploration, analysis to discussion, abstraction to generalisation and application was divided into three, which is firming up, exercise and performance task.

2.1. Contextual learning

Contextual learning is based on a constructivist theory of teaching and learning. Learning takes place when teachers are able to present information in a way that students are able to construct meaning based on their own experiences and assisting students in learning how to monitor their learning. This LM is anchored on this theory because we believed that learning is more concrete and meaningful if the lessons are designed and presented in a contextualised manner.

2.2. Four A's format

For this study, it is ideal to use the four A's format. It is the collaboration between the students and the teacher. This aims to approach the child holistically and the integration of past knowledge and the

new one, based on Kolb's Experiential Learning Theory. This format will bring what the students' knowledge has been stored, so that new information will be integrated together to have a deeper understanding of the lesson. The Department of Education in the Philippines encourages teachers to develop their lessons using the four A's format.

3. Materials and methods

3.1. Research design

This study employed a developmental research design to address the need for IMs of TLE teachers. Developmental research is the systematic study of designing, developing and evaluating instructional programmes, processes and products that must meet criteria of internal consistency and effectiveness and it is particularly important in the field of instructional technology.

3.2. Research environment

This study was conducted at Caraga State University Cabadbaran Campus (CSUCC), located at T. Curato St., Cabadbaran City, Agusan Del Norte. It was formerly known as the NORMISIST – Cabadbaran Campus and Northern Mindanao College of Arts, Science and Technology. It is a component campus of the Caraga State University Main Campus. It is a public institution of higher learning run by the Government. It is the only public tertiary school in the city of Cabadbaran. It was also decided to implement the said research in La Union National High School. It is situated at Brgy. La Union, Cabadbaran City. It has a population of 450 students and 22 teachers. The said school is considered as the target beneficiary of the output of this study which forms part of the campus' community engagements and extension programme.

3.3. Participants

Due to the pandemic, the researchers were not able to test the LM on its intended learners in La Union National High School. Instead, they used the 38 bachelor in industrial arts education 3rd-year students and four bachelor of technical teacher education irregular students as participants. They acted as learners during the simulation teaching and they also participated in the formative evaluation of the LM's being developed during the peer critiquing activity. Their evaluation and critique helped a lot in the improvement of the LM's. The La Union National High School TLE teachers were also considered as participants of this study because they also provided feedback for the improvement of the LM's.

3.4. Sampling procedure

The researchers used the purposive sampling technique in choosing the respondents in this study. It is a non-probability sampling that is selected based on the characteristics of a population and the objective of the study. The researchers used this sampling method to capture a wide range of perspectives relating to the study that the researchers were conducting. The researchers consulted some CSUCC mentors who are experts in consumer electronics to perform content evaluation of the material. The researchers also created a simulated classroom environment for critiquing activity together with the peers for a collaborative effort since they have the same academic engagement. Lastly, TLE teachers from La Union National High School were asked to participate in the evaluation process since the material was created based on their learners' sociocultural environment.

3.5. Research instrument

During the simulated classroom environment and critiquing activity, a rubric adapted from the College of Purdue, West Lafayette, IN, was used as a tool to rate the lesson implementation, which adopts a rating scale of 1–4, which indicated 1 = beginning; 2 = developing; 3 = proficient; and 4 = mastery. It evaluates the implementers teaching performance in terms of content, organisation/clarity, completeness, grammar/mechanics, documentation, delivery and interaction ability.

The researchers also used an Instructional Material Evaluation Checklist (IMEC) which was adopted from Alburo (2015) as their tool for the summative evaluation of the developed IMs. This tool was already validated and approved by Caraga State University in evaluating their IMs. The checklist consists of 21 items that assess the LM with respect to the content, organisation and structure and its influence on motivation and learning. It uses the rating scale of 1–4, which indicated 1 = no evidence; 2 = little evidence; 3 = enough evidence; and 4 = high evidence. Items under the 'Content' component of IMEC includes the alignment of the lessons with the required competencies, its relevance, accurateness and, appropriateness of learning activities to the target beneficiary. It also assesses the lessons' connections to the real-life situations and sociocultural environment of the learners. The 'Organisation and Structure' component requires the clarity of learning outcomes in the lessons, their alignment to corresponding generalisation and applications, the clarity of questions, grammatical structure, format and layout, consistency, logical organisation and opportunities for ICT exploration.

The 'Support to Learning' parameter requires provision for collaborative learning and learning tasks that are motivational and forms of assessment which can induce critical thinking, creativity and metacognition.

3.6. Procedure

A. Preliminary (Protocol)

The researchers sent a letter to the Office of the Chancellor, Division Superintendent, and the La Union National High School Principal for the approval of conducting a consultative meeting with the La Union TLE teachers. They were asked the needed information for the design of the LM's.

B. Process Proper

Step 1. In the analysis stage, the researchers organised the information gathered at the consultative meeting and analysed their pressing needs. After the analysis, the researchers conceptualised the LM's within its context and designed it based on the learning objectives of present competencies.

Step 2. The design stage was where the researchers draw a plan which will be the road map for the proposed LM, which was derived from the information from the previous step. It also shows the sequence of the design activity worksheets and what are the needed materials that can be substituted by the locally available materials. This step shows the draft format of the possible learning activities in the LM.

Based on the information from the previous steps, the possible 10 lessons based on the grade 7 competencies in electronics servicing are the following:

Lesson 1. Occupational Health and Safety: 5s

Lesson 2. Occupational Health and Safety: Personal Protective Equipment (PPE)

Lesson 3. Occupational Health and Safety: First Aid

Lesson 4. Common Electronic Tools

Lesson 5. Multi-tester

Lesson 6. Conductor and insulator

Lesson 7. Resistor

Lesson 8. Resistor Colour Coding

Lesson 9. Capacitor

Lesson 10. Soldering

Step 3. It was in the development stage that the researchers actualised the plan based on the design stage. This is where they wrote and refined the prototypes of the proposed LM's using the four A's format. The prototype was tested in a simulated classroom environment and critiquing activity amongst the researchers' peers and also by experts in the field was carried out to gather data to improve the LM. After the simulated evaluation of the prototype, it also underwent a series of formative evaluation to further enhance the LM.

Step 4. The implementation stage was where the researchers test the proposed LM's on its intended learners. Due to the pandemic, the researchers were not able to test it in La Union, instead they conducted a demonstration teaching in the tertiary level and solicit feedbacks. The feedback of the students, teachers, panel of judges and advisers was collected before the prototype underwent formative and summative evaluation.

Step 5. After critiquing the prototype, a series of revision were done based on a new set of formative and summative evaluation. Depending on the results of the evaluation, the whole ADDIE (analysis, design, development, implementation and evaluation) process might be repeated if needed.

3.7. Data analysis

The LM proposed by the researchers underwent a series of evaluations. Descriptive statistical tools were used to present a quantitative description in a manageable form. The study made use of frequency count to determine the number of responses in each item in the questionnaire. Weighted mean was employed to determine the average based on the weight of the chosen option. It helped in simplifying a large amount of data into a sensible way and reduced lots of data into a simpler summary.

4. Results and discussions

4.1. Design of the IM

This study focused on developing an LM that can be integrated into the daily activities of the students. It aimed to integrate the culture, locality and interest of the students in learning TLE subjects using the proposed material. The researchers followed the ADDIE process in developing the LM's for consumer electronics exploratory course of grade 7.

4.1.1. Analysis phase

This phase identified and analysed the problem that needs to be addressed. The researchers gathered information that can give them ideas on what type of LM's they need to develop. They also looked for factors that affect student's learning in La Union National High School. They also identify the competencies involved in consumer electronics based on the DepEd K–12 Curriculum. Table 1 presents the results of the analyses of the lessons in CES for grade 7 in relation to their learning outcomes, corresponding performance tasks and exploration activities as the springboard for class discussions.

Table 1. Lesson matrix for TVL in consumer electronics for grade 7 learners

Lessons based on DepEd TVL learning competencies	Intended learning outcome	Performance tasks	Learning activity (Exploration)
1. Occupational Health and Safety: 5 seconds	Define what is 5 seconds Discuss the importance of 5 seconds; and Perform 5 seconds in a real classroom setting	A group activity, each group will apply 5 seconds by implementing each phase. Then they choose 1 representative to discuss in the class what they are doing. (10 minutes).	Each group will be given 10 minutes to observe a given picture and they will write down how they can apply 5 seconds in that picture.
2. Occupational Health and Safety: PPE	a. Discuss the importance of PPE in the workplace, and b. Demonstrate how to use personal protection equipment properly.	Each group will choose a member who will demonstrate one of the PPE provided, and show to the class how to use it and explain why it is needed.	Role-playing: Each group will pick a scenario that they will act. They will do it as if they are working in the mining areas, construction sites, as an electrician, and a factory worker. They need to find which PPE is appropriate in that working area. They will just select one representative to dress up. (10 minutes)
3. Occupational Health and Safety: First Aid	a. Identify the common injuries in the laboratory b. Discuss the importance of learning first aid; and c. Demonstrate how to apply first aid in various situations.	Each group will pick a situation that they will act. They need to identify which first aid is appropriate in that certain situation and demonstrate it. Then they will choose a member in their group to explain what scenario they are portraying and why that certain first aid is appropriate in that situation.	Role-playing activity: Assuming that they are in school playing with their classmates. One of their classmates was sharpening his pencil with blades and was accidentally bump and as a result his fingers was cut. He was shocked at first and then he screams in pain! What will the group do? (15 minutes)
4. Common Electronic Tool	a. Identify the common electronic tools b. Discuss the importance of each tool c .Demonstrate the proper usage of each tool; and d. Classify whether it is hand tools or power tools	Each group will choose 2 representatives to demonstrate the proper use of specific hand tools and materials that are given by the teacher.	Let everyone familiarise the tools in the table. Each tool has a corresponding name written in the paper. They are given 5 minutes to familiarise all the tools and guess what the teacher is going to point out, one at a time in answering.
5. Multi-tester	a. Identify the different types of multi-tester	With their group, they will be given 5 LED bulbs that they need to measure its	They will group into 5 members. Each group will be given a set of materials.

	b. Discuss the importance of multi-tester; and c. Perform the proper usage of multi-tester	resistance. Write the answer in the answer sheet provided	They will observe the multi-tester while reading the voltage, resistance, and current of the materials. They will write what they have observed in the answer sheet provided. This will be done in 10 minutes.
6. Conductor and Insulator	a. Identify whether the type of materials used in an electronic device is conductor or insulator b. Discuss the purpose of each material; and, c. Demonstrate how to make an electric circuit.	They will select one conductor and one insulator from materials in the classroom. As explained earlier, show how a circuit can be used to test for conductivity. Demonstrate what happen to the light bulb when both the conductor and insulator become a part of the circuit and explain why that material was chosen.	Group activity: Each group will choose materials in the classroom. They will classify it into two groups – conductors or insulators. Then they will write the answers in the sheet given. (10 minutes)
7. Resistor	a. Discuss what is a resistor; b. Identify the types of resistor; and c. Explain the characteristics of a resistor	They will place the picture on the board together with its name. The losing group will perform a chicken dance.	Role-Playing: Divide the class into four groups. Each group will receive a mystery box. To unlock the mystery box, they will just simply answer the following questions given by the teacher. The first group who will raise a correct answer will have a chance to open the mystery box. The first group that will reveal all the content of the mystery boxes will receive a reward.
8. Resistor Colour-coding	a. Familiarise the Colour-coding chart b. Identify the value of each colour in the resistor c. Calculate the value of the colour-coded resistor.	They will group into four members and each group will follow the procedures below: Procedure: Arrange the resistors on a piece of Styrofoam in a random manner. Identify the colours of the resistors one by one and write it in the activity sheet. Answer the following questions being asked and compute the overall value of each resistor.	They will be finding the colour of the resistor. They students will group into 5 members. Each group will be provided with 5 resistors. They look for the first 3 colours of the resistor in a correct manner. Write the colours on a piece of paper. (Don't write the colours repeatedly.) They are given 10 minutes to answer.
9. Capacitor	a. Discuss the importance of capacitor b. Identify the common types of capacitor and their functions; and	The class will be divided into 4 groups. Each group will find and remove the capacitor on the PCB and identify what type of capacitor it is. Select one representative in your group to present and discuss	Video presentation. They will take down notes all the important things. After the video presentation, there's a short quiz.

	c. Explain the main characteristic of a capacitor	it at the front.	
10. Soldering	a. Identify the common tools and materials used in soldering; and b. Demonstrate the proper soldering procedure	Each group will be provided with five pieces of copper wires and a soldering iron. It depends on what strategy they are going to use as long as they build a house out of the copper wires given. Make sure that the house can stand on its own even if it falls at a meter height.	They will guess and explain the materials provided by the teacher and identify what kind of materials they used to join the output.

Due to the type of curriculum which is outcomes-based education, the researchers are having a hard time coming up with appropriate activities that will achieve the learning objectives of the lesson. The researchers also had difficulties in contextualising the lesson and due to the pandemic; the list of activities to choose from are limited.

4.1.2. Design phase

The researchers followed the four A's format but instead of using the standard description they decided to change it from activity to exploration, abstraction to discussion and generalisation, assessment to firming up and exercises and lastly application to performance task.

Preliminary

- Visualisation of concept comprises of picture/s familiar to the learners illustrating practical applications of the concept in the society. It serves as an overview of the concept.

Lesson Proper

- Intended learning outcome (ILO) is the end result that learners are expected to achieve, preferably, to involve the learning domains – cognitive, affective and psychomotor. ILO starts with the phrase, "At the end of this session, you will be able to:"
- Exploration is a motivational activity (preferably, group work) that serves as a springboard for discussions. Usually, this involves a hands-on activity that uses materials that are very familiar with the environment of the learners. This activity could also be a video presentation, role-playing, a game, etc... It assesses what the learners already knew and what they still have to know.
- The discussion consists of logically sequenced questions based on the exploration activity. These sets of questions are also called scaffolding questions that induce learners' critical thinking and guide them to construct or formulate the concept on their own. The interaction helps the learners to think and inquire throughout the discussion.
- Abstraction consists of question/s that intends to draw in the learners' broad idea/description /statement about the main concept/s of the lesson. It measures how much the learners understand from the discussion. It jives with the ILO.
- Firming up is a form of assessment. It may consist of a follow-up exercise/ questions/activity (preferably, by a group) to verify/clarify learners' understanding of the concept. It jives with ILO.
- Exercises are a form of assessment on individual learner's understanding and intend to further clarify the concept/s (preferably, a set of multiple-choice questions. It must jive with ILO.

- Performance task is an activity (individual or group) that allows the learners to apply the concept and demonstrate concretely their understanding while enhancing their creativity. It jives with ILO. A rubric is provided as a tool in evaluating the performance tasks.
- Concepts review provides a summary of important terms and concepts in the lesson for learners' easy reference.
- 'Check it out' consists of links to websites that provide concept enrichment/supplement.

4.2. Development of the LM

4.2.1. Development phase

From the format designed in the previous phase, the researchers developed the LM based on the data or information they got from the previous phases. This research was developed by following the patterned lesson study from Japan and by following also the format and guidelines in lesson designing. When the lessons were already developed it underwent peer critiquing where the peer gives their comments and suggestions. The researchers accepted the comments and suggestions that were given by their peers. After that, the researchers revised the lessons and gave it to the adviser for further critiquing. The lessons were then sent back to the researchers for another revision following the comments and ideas given by the adviser.

The critiques from the peers during demo teaching and the comment from sharing of ideas are more on the organisation of the activities and their instructions should be clear. They also mentioned that the materials used should be common and familiar to the students for them to relate and as much as possible it should be contextualised. Moreover, the advisers and experts' critics emphasise on the comments that the researchers should add pictures or representations with appropriate sizes. Also, proper citations and references should be done and discussions should be broadened.

The researchers improved the 10 lessons based on the comments of the peers and the adviser. It has undergone a lot of revision due to the results of the peer critiquing and the inputs of the advisers.

4.2.2. Implementation phase

Production of the prototype of the LM in TLE focusing on CES was completed during off-school term. This means that the learners, who are the target beneficiaries of the material were not available in schools. This scenario posed a drawback in the implementation of the LM in an actual classroom environment. To ease the predicament a bit, a simulated classroom environment with the researchers' peers acting as learners was created. The implementation of the lessons was carried out in the form of micro-teaching. The disadvantage of the process, however, was that only three out of ten lessons were tried out in the simulated classroom environment attributed to time constraints brought about by the suspension of classes due to COVID 19. Nevertheless, researchers ensure that all lessons were subjected to critiquing by peers, advisers and experts in the field. During the micro-teaching, a minimum of ten peer-participants acted as evaluators.
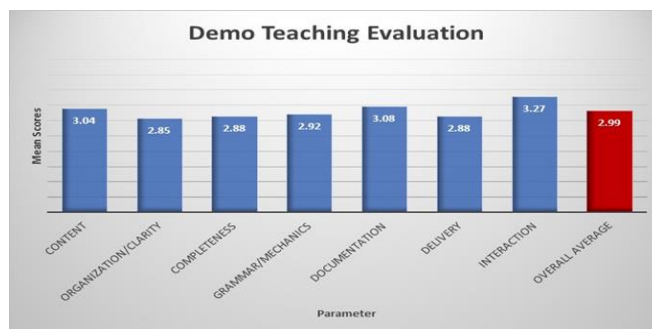

Figure 2. The extent of peer-evaluators' rating during lesson implementation in the simulated classroom environment

The rest of the class, about 30 peer-participants, acted as learners during the simulation. The peer-evaluators provided a general assessment of the lesson taught by the researchers as implementers using a rubric that highlights the parameters for evaluation which include: content, organisation and clarity, completeness, grammar, documentation, delivery and interactions. Figure 2 shows the result of peers' ratings during lesson implementation in a simulated classroom environment.

The rating scale of 1–4, which indicated 1 = beginning; 2 = developing; 3 = proficient; and 4 = mastery, was used in evaluating the materials. The figure shows the assessment of the implementers teaching performance in terms of content, organisation/clarity, completeness, grammar/mechanics, documentation, delivery and interaction ability. Its overall rating gathered from the peer evaluators is 2.99 with a descriptive rating of proficient. This implies that the researchers still need to enhance the lesson and their skill to deliver as well, in order to attain mastery of the lesson.

Among the parameters, the evaluators rated lowest in parameters of completeness, clarity and organisation and delivery. The ratings suggest that implementers need to focus enhancement on those aspects of the lesson and in the implementation or delivery of the lesson.

Based on the critiques derived from the demo teaching, each lesson has an area that needs to be enhanced but majority of it points out the importance of the improvement of the motivational activity and application of images that are related to the topic/lesson. The researchers come to the decision of revising the whole lesson due to these enhancements. Appropriate revisions were also undertaken for the development of the manuscript due to the revision of the lessons.

4.3. Evaluation of LM

Due to lack of time, the researchers were not able to test the LM on the grade 7 students of La Union because it was already the end of the school year for Department of Education. Instead, the researchers implemented it as a demonstration in their own classroom environment – the researchers as teachers and their peers as learners. Their performances and works were evaluated by a panel of judges which was identified before the demonstration which were all their peers and faculty members who are experts in the field. This evaluation is formative, it used rubric, and the results help the researchers in enhancing the LM's.

4.3.1. Summative evaluation

After the formative evaluation, a panel experts in the field of TLE were asked to evaluate the LM's using the IMEC. This is the summative evaluation that assesses the content, organisation and structure, and support to learner parameters. The results again prompted the researchers to revise the LMs and enhance the parts that needed improvement based on the comments and suggestions of the experts.
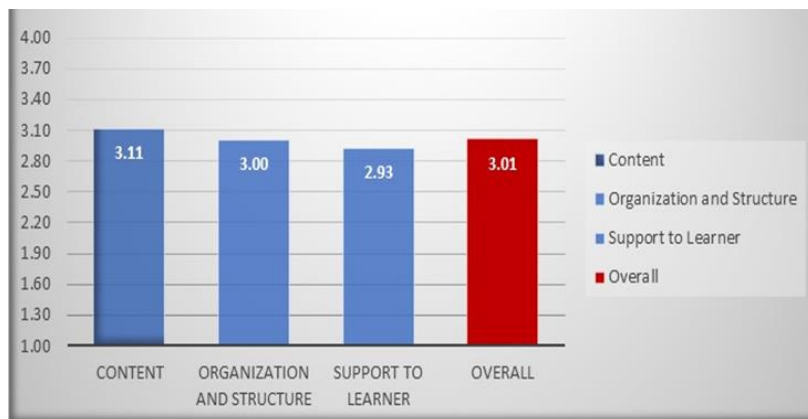

Figure 3. IMs evaluation checklist results

Figure 3 shows the average of the evaluation conducted by the experts using the IMEC. The data show the assessment result of the experts in the content, organisation and structure, and its support to learning parameters of the LM. The average of each parameter is not that different from each other, having only an interval difference of 0.1 with almost all of it in the line of 3. The overall mean based on the IMEC evaluation is 3.01 with a descriptive rating of enough evidence. This implies that the newly developed LM has enough evidence that it can facilitate learning but still needs further enhancement to effectively support the learning of the students.

Noticeably, evaluators rated the 'support to learning' parameter as the lowest. This implies that the enhancement should be more focus on its connections to real-life situations and sociocultural environment of the learners. Raters also emphasised improvement in the organisation of ideas, clarity of questions asked and directions, unity of the concepts presented in every section of the lesson and consistency in the format. They also point out the lack of rubric in some performance tasks.

These results entail that while the lessons had gone through many peer critiquing and revisions, the improvement is not quite enough to show evidence that the IM satisfactorily satisfies the requirements stipulated in the items under each parameter. Generally, experts' ratings suggest that the researchers need to revisit the critiques in each lesson and go back to the analysis stage of the ADDIE process.

5. Conclusion

Based on the analysis of the data that were gathered, the researchers were able to design and develop a contextualised LM in consumer electronics for grade 7, following the ADDIE model and using the four A's format. However, due to the time constraint amid COVID19 pandemic, the researchers were not able to test it on the intended recipients. Based also on the evaluation results, the lessons need further enhancement before they can satisfy the standard in facilitating learning.

6. Recommendations

- Future researchers can improve the content of the LM by integrating the 21st-century skills without neglecting the culture and learning environment of the learners;
- Continue this study and apply it to an actual grade 7 classroom setting to test its learning effectiveness;
- Let other experts validate the reliability of the content of the LM's to improve its learning efficiency.

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