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Development and Validation of Most Essential Learning Competency- Based Workbook in General Physics 1 for Senior High School

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Abstract

One of the best things a teacher can do to help students achieve a quality learning process is to create and validate instructional materials. With this, a descriptive-developmental research design following 3phase namely development, implementation, and evaluation was utilised to develop the most essential learning competency-based workbook in General Physics 1 for Senior High School and validate it through a rating scale distributed to groups of respondents. The developed MELC-based workbook in General Physics 1 was based on the 85 most essential learning competencies for the whole semester using the six components namely topics, specific objectives, key concepts, directions, activities, and reflections. The three groups of respondents were the purposely selected group of experts; all teachers handling General Physics 1 in the Division of Northern Samar and all grade 12 STEM students enrolled in the STEM strand at the Bobon School for Philippine Craftsmen on the first semester of SY 2021-2022. Moreover, mean and standard deviation were used to measure the validity of the workbook. The study disclosed that the respondents evaluated the workbook to be both content and face-valid as proved in their questionnaire labelled as "agree" in the indicators. Furthermore, the results showed that the MELC-based workbook has met the standard and could be used as a learning material. Therefore, it was recommended by the researchers that the said workbook be used as learning material for the said subject matter. Further study on the effectiveness of the said workbook must be conducted with consideration of some factors.

Keywords: General Physics Workbook, instructional material

Introduction

The quality of education is the primary concern of every teacher to all students. As a result, teachers constantly create and put into practice new strategies and techniques to aid students in achieving mastery levels in each learning competency. In this regard, one of the best things a teacher can do to help students to achieve a quality learning process is to create and validate learning resources or instructional materials, such as a workbook. During the teaching and learning process, the utilisation of instructional materials is crucial. Thus, the use of educational materials by teachers would substantially aid them in explaining the learning process to students in particular. Additionally, a learning tool like a workbook incorporates learning techniques that assist pupils to develop certain skills in addition to being a compilation of tasks (Adora, 2014; Adora, 2019; Rongayan, Jr. & Dollete, 2019). The students will also be able to build self-discipline, study habits, and initiative through the usage of learning resources which are the best practices to help them to be prepared for higher education (Li, 2016).

Needless to say, it is essential to use instructional resources like workbooks, modules, visual aids, and others for teaching and learning since these educational resources encourage and provide a concrete learning experience. Teachers, therefore, should continue to develop teaching resources like workbooks as suggested by Jean Piaget's Cognitive Learning Development Theory and Howard Gardner's Multiple Intelligence Theory (Zhuo & Brown, 2015).

Furthermore, the study on converting traditional classrooms for instruction into student-based classrooms using multimedia-mediated learning modules has shown that using multimedia-mediated learning modules, or simply using self-paced learning materials, is one of the contemporary and timely approaches best suited to student-based learning because it encourages students to take initiative to continue learning at their own pace and in their own space. In this way, the pupil could cultivate a sense of accountability and strive to learn more and perform better (Li, 2016).

On the other hand, many secondary school students, as well as some adults pursuing academic degrees, find physics to be a challenging subject (Ekici, 2016). This is due, partially, to the fact that physics is a science that necessitates mathematics. This suggests that a stronger foundation in mathematics is required if one wants to be proficient or achieve mastery of physics. However, the results of 2019 Trends in International Mathematics and Science Study (TIMSS) by the International Association for the Evaluation of Educational Achievement (IEA) for the Philippines is problematic (Mullis *et al.*, 2020). The Philippines set a "new record" in the Programme for International Student Assessment (PISA), ranking second to last in terms of both mathematics and scientific literacy (Bernardo, 2020). Consequently, a number of problems, such as lack of teaching resources, inadequate teacher training, and lack of facilities to foster a scientific culture among Filipino students, are blamed for the low performance in science (Jalmasco, 2014; Rabino, 2014). Along these lines, the lack of instructional materials that are aligned with the target's most essential learning competencies, especially in the senior high school under the strand of Science, Technology, Engineering, and Mathematics (STEM) subjects, makes it challenging for teachers to teach some science concepts and principles (Rongayan & Dollete, 2019; Tugade, 2016). However, vis-à-vis this problem, the researchers also considered the difficulty of creating instructional materials that are relevant, research-based, and aligned to the target competencies in order to create a transition from a conventional to student-based teaching instruction in light of the aforementioned reason and the role of teachers as the primary implementers of the K–12 Curriculum.

Recently, the Department of Education (DepEd) Order No. 012, Series 2020, which addresses how to adapt the Basic Education Learning Continuity Plan (BE-LCP) for the 2020–2021 school year considering the COVID–19 Public Health Emergency, was presented as a guide and instruction for guaranteeing the quality of education when using various learning modalities. The utilisation of printed self-paced learning materials through modular distance learning is one of those learning methods. In a distance learning modality, the teacher and the pupils are geographically separated for the entirety of the learning process. Furthermore, DepEd has provided printed module materials for those remote regions with very low internet connectivity. The pandemic's humiliating experience has, however, raised questions about the effectiveness and timeliness of the delivery and replication of the self-paced learning materials from the various divisions. Since some of the activities are highly challenging for the students, there are also problems with the contextualisation of the content of the learning materials.

As a result, the researchers think it is essential to take into account the localised and contextualised approach in the self-paced learning materials for remote learning, in line with the aforementioned principle. The BE-LCP is required to rearrange the K–12 Curricula into the Most Essential Learning Competencies (MELC), according to DepEd Order No. 012, Series 2020 for School Year 2020–2021 only, the MELC must be delivered on a national level. Though, the DepEd does stress that the MELC experience will be used to update and enhance the curriculum. There are only eight learning competencies that are not included in the MELC of General Physics 1 for the STEM strand since they require implementation and are not applicable to modular remote learning.

With the onslaught of the COVID-19 pandemic and the introduction of modular instruction as one alternative mode of learning, it has become even more imperative to develop instructional materials by which students will have their own independent and self-paced learning. In addition, keeping in mind the vision and mission of the DepEd under the K-12 curriculum which is to help students, especially those who are enrolled in the STEM strand to attain betterment through quality education, the researchers then came up with a study that focused on the development and validation of a MELC-based workbook in General Physics 1 for senior high school students which used the Reigeluth's (1999) Instructional-Design Theory as the foundation for this research. The Instructional Design Theory provides precise instructions on how to aid in the growth and learning of learners. The aforementioned theory identified two critical aspects of instruction and methodology in learning. First, it was stressed that instructions should contain: (a) clear information, such as descriptions and examples of the objectives, the knowledge required, and the performance expected; (b) opportunities for learners to actively and reflectively engage in learning activities; and (c) the aforementioned activities must be rewarding and highly motivating. Second, the aforementioned theory also emphasised that approaches should be situational depending on the circumstances of the learning environment and the desired learning outcomes.

Specifically, it sought to answer the following questions: (1) What are the components of the MELC-based workbook in General Physics 1?, (2) What is the assessment of the group of experts on the MELC-based workbook in General Physics 1 for senior high school in terms of the content validity (topic, specific objectives, key concepts, directions, activities, and reflections) and face validity (language used, format and layout, and level of difficulty)?, (3) What is the assessment of the group of experts, teachers handling General Physics 1 and Grade 12 students on the face validity of MELC-based workbook in General Physics 1 in terms of the language used, format, and layout?, and (4) What is the assessment of the group of experts and teachers handling General Physics 1 on the face validity of MELC-based workbook in General Physics 1 in terms of the level of difficulty?

Methodology

The study utilised descriptive-developmental research design in developing and validating a MELC-based workbook in General Physics1 for senior high school. In developmental research, instructional products or processes are designed, developed, and evaluated (Adora, 2014; Adora, 2019; Rongayan, Jr. & Dollete, 2019). In conducting the study to forty-four (44) respondents, as appeared in Table 1, composed of experts in the field, teachers, and students, the researchers utilised an adapted rating scale (Adora, 2014) in gathering the needed data for the study in answering the problems posed in the study, particularly in terms of content validity and face validity. To ensure that the data to be collected would meet the criteria for valid interpretation and analysis in this study, the adapted rating scale was presented to the experts for content validation.

Table 1. *Frequency Distribution of the Respondents of the Study.*

Group of Respondents	f
Experts	5
Teachers handling General Physics	6
Grade 12 STEM students	33
Total	**44**

A purposive sampling was utilised in the first group of respondents, the group of experts. They were composed of five professors/teachers: three (3) with master's degree in Physics, an English Major and a psychometric expert. On the other hand, total enumeration was used in selecting the second group which were composed of six (6) senior high school teachers handling General Physics 1 in the Division of Northern Samar and the third group of respondents who were composed of 33 Grade 12 students enrolled in STEM strand at the Bobon School for Philippine Craftsmen on the first semester of SY 2021-2022. The entire study was conducted in selected schools in the Division of Northern Samar.

The researchers gathered the data in three phases. The first phase was the development of the MELC-based workbook in General Physics 1. In this phase, the researchers first identified the most essential learning competencies in General Physics 1 and then formulated activities that were deemed relevant to the identified most essential learning competencies set by the DepEd.

The second phase was the implementation phase where the researchers first secured permission from the authorities to conduct the study. The researchers also asked the consent from the author of the rating scale as an instrument to be used in this study. Since the instrument was an adaptation of a previous work and validation had been conducted already by the said author with a validity score of 0.996, the present instrument then no longer needed its own validation. To ensure that the data to be collected would meet the criteria for valid interpretation and analysis in this study, a rating scale was presented to the expert panel members for content validation. After their scrutiny and having found the rating scale used was valid, the researcher then prepared the final instrument. Then, the rating scale and the MELC-based workbook in General Physics 1 were distributed to the three groups of respondents simultaneously at their convenient time within the first semester of the school year 2021-2022. The researchers personally conducted the implementation of the study. The group of experts and the group of teachers handling General Physics 1 were given enough time to scrutinise the MELC-based workbook and rated it accordingly. On the other hand, the group of students used the workbook as a part of the instructional material in General Physics 1 for the first semester which was administered by the researchers and then the latter was given time to rate the said workbook. The researchers administered the workbook through online discussion and limited face-to-face discussion in accordance with the health and safety protocol.

The third phase, the evaluation, was on analysis and interpretation of data that were collected from the second phase. The assessment of the content validity and face validity was determined with the use of statistical treatment.

Results and Discussion

The result of the analysis served as the basis for drawing out appropriate conclusions and recommendations. Mean value and standard deviation were used to describe the content and face validity of the workbook in General Physics 1 in terms of its components: topics, specific objectives, key concepts, directions, activities, and reflection.

Table 2. *Components of the MELC-Based Workbook in General Physics 1.*

	Components	Description
1	Topics	These are logically arranged based on the sequence of the most essential learning competencies.
2	Specific Objectives	These are specified objectives based on the most essential learning competencies.
3	Key Concepts	These are brief descriptions of the concepts areas to help the students/users of the workbook to recall some important points in the topics.
4	Directions	These are to lead the students/users of the workbook in answering the learning activities.
5	Activities	These are to provide learning opportunities for the students/ users of the workbook for developing mathematical skills and higher-order thinking skills.
6	Reflection	These are questions given after every set of rotations to encourage the students/user of the workbook to have a depth- analysis of his/her learning experience with this workbook.

Table 2 shows the six (6) components of the developed MELC-based workbook in General Physics 1. These were the topics, specific objectives, key concepts, directions, activities, and reflections. The researcher decided to use these components in parallel to the study of Adora (2014) and DepEd Order no. 1 series 2021 which provides specifically the guidelines on the evaluation of self-learning modules, but not including reflection. Teachers and students are expected to supplement the workbook with other learning materials to understand better the science concepts (Rongayan, Jr. & Dollete, 2019) since the workbook is merely one instructional material that teachers and students may use to enhance their learning. It is beneficial to introduce basic information to an entire class with instructional materials, thereby eliminating the need to conduct hours of lecture discussion (Garcia, 2020).

Furthermore, there is an increasing demand for STEM instructional materials to prepare students for a technologically and scientifically advanced society (English & King, 2015). Consequently, Cruz (2014) suggested that validated worktexts are considered as qualified if they have the characteristics that will help students enhance their performance.

Assessment of Experts on the Content and Face Validity of MELC-based Workbook *Content Validity*.

The group of experts assessed the MELC-based workbook in General Physics 1 for senior high school in terms of content validity. This aspect is composed of six (6) components namely: topics, specific objectives, key concepts, directions, activities, and reflection.

Table 3. *Mean and Standard Deviation on Experts' Assessment of the Content Validity of the MELC-Based Workbook in General Physics 1 in terms of Topics, Specific Objectives and Key Concepts.*

Content Validity	M	DES	SD
Topics			
1. The topics are sequenced according to Most Essential Learning Competencies (MELC)	4.80	SA	0.45
2. The topics are carefully organised.	4.60	SA	0.89
3. The topics are well-constructed.	4.40	A	0.55
4. The topics are logically arranged.	4.40	A	0.89
5. The topics are time-bounded.	4.40	A	0.55
Average	**4.52**	**SA**	**0.67**
Specific Objectives			
1. The specific objectives are based on the target learning competencies.	4.60	SA	0.55
2. The specific objectives are clearly stated and easily understood.	4.40	A	0.89
3. The specific objectives are measurable.	4.40	A	0.89
4. The specific objectives are attainable within the specified time limit.	4.20	A	0.84

5. The specific objectives are result-oriented	4.40	A	0.55
Average	**4.40**	**A**	**0.74**
Key Concepts			
1. The key concepts give insights and ideas about what the activity is all about.	4.40	A	0.89
2. The key concepts provide a background of concepts and information about the topic to be solved.	4.00	A	1.41
3. The key concepts arouse the learner's interest in solving the exercises.	3.60	A	0.55
4. The key concepts attract the learner's attention.	3.80	A	0.45
5. The key concepts are simple and comprehensive.	3.80	A	1.64
Average	**3.92**	**A**	**0.99**

Table 3 shows the assessment of the experts on the content validity of the MELC-based workbook in terms of topics, specific objectives, and key concepts. The topics of the workbook in General Physics 1 have been rated with an average mean of 4.52, described as "agree" with a standard deviation of 0.67. This data implies that the experts strongly agreed that the topics included in the workbook were well constructed, time–bound, logically arranged, and sequenced according to the MELC as required by the DepEd. Furthermore, the table also revealed that the specific objectives of the said workbook were rated with an average mean of 4.40, described as "agree" with a standard deviation of 0.74. Meanwhile, the key concepts were rated an average mean of 3.92, described as "agree" with a standard deviation of 0.99. This indicates that the specific objectives have met the requirements stipulated in the MELC and were captured by the users of the workbook to be clear, attainable, measureable, and result-oriented. This result is in line with the idea of Agustin (2019) who stressed that in developing a worktext, it should essentially meet the level and needs of the students. In addition, it also adheres to the principle that each lesson's content should offer students the opportunity to achieve the lesson's objectives (Basilio & Sigua, 2022).

In the same way, the experts also agreed that the key concepts of the workbook were useful, insightful, and comprehensive to the learners, despite the ratings being a bit lower than the other components. It means that the workbook has not fully met the expectations in arousing the interest of the learners. Therefore, further improvement and revision are needed to increase a strongly agree rating.

Table 4. *Mean and Standard Deviation on Experts' Assessment of the Content Validity of the MELC-Based Workbook in General Physics 1 in terms of Directions, Activities, and Reflection.*

Content Validity	M	DES	SD
Directions			
1. The directions are simple and clear.	4.20	A	1.10
2. The directions are easy to follow.	4.40	A	0.89
3. The directions are properly sequenced.	4.00	A	1.00
4. The directions can be done independently.	4.20	A	0.84
5. The directions lead the learners to answer the activities.	4.40	A	0.55
Average	**4.24**	**A**	**0.87**
Activities (Learning Space/Application/Take a Challenge)			
1. The activities are relevant to the objectives.	4.20	A	0.45
2. The activities are adequate to develop learners' mathematical and scientific knowledge and skills	4.20	A	0.45
3. The activities are adjusted to the learner's abilities.	4.40	A	0.55
4. The activities are sufficient to determine the learner's mastery level.	4.20	A	0.45
5. The activities provide opportunities for the development/ enhancement of mathematical and higher-order thinking skills.	4.40	A	0.55
6. The activities arouse learners' interest making learning effective and enjoyable.	3.80	A	1.10
7. The activities are contextualised.	4.20	A	0.45

Average	**4.20**	**A**	**0.57**
Reflection			
1. Learning experiences are expressed through reflection.	4.60	SA	0.89
2. The reflection gives insights to the teacher if the learner needs remediation or enrichment.	4.60	SA	0.55
3. The reflection guide questions help the learners to reflect on or examine their learning experience.	4.20	A	1.10
4. The reflection encourages the learner to provide an in-depth analysis of the learning experience.	4.20	A	1.30
5. The reflection evaluates the relevance of the workbook.	4.60	SA	0.89
Average	**4.44**	**A**	**0.95**

As reflected in Table 4, the experts assessed the workbook in General Physics 1 with an average mean of 4.24, described as "agreed" with a standard deviation of 0.87 for directions; and an average mean of 4.20 described as "agreed" with a standard deviation of 0.57 for the activities, and an average mean of 4.44 described as "agreed" with a standard deviation of 0.95 for reflection.

The results imply that the directions of the workbook in General Physics 1 were helpful for the learners to answer the activities easily. In line with this, the experts also agreed that the activities of the workbook are relevant to the objectives. It sufficiently provides the learners with opportunities to develop their mathematical and scientific knowledge and skills as well as higher-order thinking skills. Accordingly, the workbook supports the notion of Shahat *et al.* (2013) that learners need an environment that encourages active learning, critical thinking, scientific inquiry, and problem-solving. Yang and Liu (2016) hypothesised that inquiry-based tasks are intended to guide teachers and students in doing inquiry-based teaching and learning. Thus, the quality of inquiry-based tasks is crucial.

However, one of its indicators, "*the activities arouse learner's interest making learning effective and enjoyable*" was rated lower than the others and with a greater standard deviation. This is also evident in the "key concepts" part and implies that the workbook failed to meet the expectations of the learners in terms of enhancing their motivation and interest in learning the subject. This provided an implication that the workbook, even though crafted based on the needs of the learners, cannot just be considered as a standalone learning material; without the supervision and guidance of the teachers since learners were not used to do the activities independently. It means that the activities in the workbook can be further improved to increase interest and motivation. Furthermore, learning can become more significant, enjoyable, meaningful, and interesting by using worktexts that contain clear information and directions (Agustin, 2019).

The assessment on the component "reflection" was perceived to assist learners in evaluating their needs and the relevance of the workbook to them through in-depth self-examination of the learning experience with the help of the guide questions. This is in line with the study of Xhaferi & Xhaferi (2017) which found that reflection journals assisted students with learning strategies and becoming more independent.

Table 5. *Mean and Standard Deviation on Experts' Assessment of the Face Validity of the MELC-Based Workbook in General Physics 1 in terms of Language Used, Format and Layout and Level of Difficulty.*

Face Validity	***M***	***DES***	***SD***
Language Used			
1. The workbook uses formal language.	5.00	SA	0.00
2. The workbook observes correct grammar.	4.00	A	0.71

3. The language is comprehensive in terms of vocabulary.	4.00	A	0.71
4. There is good clarity and ease of understanding in the language used.	4.20	A	0.45
5. There is a sufficient familiar vocabulary to ensure learning.	3.80	A	0.84
6. The scientific terms used are comprehensibly defined.	4.00	A	1.22
Average	**4.17**	**A**	**0.65**
Format and Layout			
1. The workbook is clear and simple.	4.40	A	0.89
2. The workbook provides concrete visual clues.	4.20	A	0.84
3. To avoid duplication, the workbook is arranged logically.	4.40	A	0.55
4. It has a well-organised layout that makes the whole self-instruction material appealing and understandable.	4.40	A	0.55
5. There are appropriate structures, styles, and formats for the target audience.	3.80	A	0.84
6. The font sise is readable enough for the learners.	4.40	A	0.55
7. The color scheme is appealing to the eye.	4.40	A	0.55
Average	**4.29**	**A**	**0.64**
Level of Difficulty			
1. Learning activities are designed to accommodate learners with varying attitudes and abilities.	4.00	A	0.71
2. There is a good fit between the activities and the subject matter.	4.20	A	1.30
3. The activities are interesting, relevant, and self-motivating to the learner.	4.40	A	0.55
4. The activities are contextualised to which the learners can relate.	4.00	A	0.71
5. Every instruction is simple to understand and follow through.	4.00	A	0.71
Average	**4.12**	**A**	**0.79**

As presented in Table 5, the experts rated the language used in the MELC-based workbook as "agree" with an average mean of 4.17 and a standard deviation of 0.65; format and layout with an average of 4.29 described as "agree" with a standard deviation of 0.64; and the level of difficulty with an average mean of 4.12 described also as "agree" with a standard deviation of 0.79.

This data revealed that the experts agreed that the language used in the MELC-based workbook was formal, observed correct grammar, easy to understand, and comprehensible in terms of vocabulary. One of the indicators of language used in which "the workbook uses the formal language" was perfectly rated with a mean value of 5.00 and a 0.00 standard deviation. This implies that the experts unanimously and strongly agreed that the language used in the MELC-based workbook is proper and suitable for the learners. The students learning of the subject matter is indeed influenced by the use of clear, visible images and language (Cajayon & Benavides, 2022).

Furthermore, the format and layout used in the MELC-based workbook were assessed to be simple, readable, comprehensible, well-organised, and appropriate to the level of the learners. All the indicators were described as "agree" by the experts. In congruence to this rating, the level of difficulty in the MELC-based workbook was also evaluated to be favorable on the part of the learners because the experts agreed that the activities in the said workbook were contextualised, relevant and suitable to the level of the learners and the instructions were clear and easy to follow. Also supporting this result is the Inan and Erkus (2017) report, which notes that worksheets can be delivered visually and textually, which goes beyond traditional classroom delivery methods.

The overall assessment of the experts on the validity of the MELC-based workbook in General Physics 1 in terms of content validity (M = 4.29; SD = 0.80) and face validity (M = 4.19; SD = 0.70) which

were both described as "agree".

The data imply that the MELC-based workbook in General Physics 1 has met the requirements both in content and face validity for the material to be considered an acceptable and valid workbook for the intended learners. The research on these findings was consistent with several other studies (Evangelista *et al.,* 2014; Ocampo *et*

al., 2015; Pastor *et al.,* 2015, Rongayan, Jr. & Dollete, 2019). However, it has not reached the optimum rating which is "strongly agree". Therefore, it can be inferred that there is still room for improvement and further enhancements through revisions of the said workbook. Subsequently, Cajayon and Benavides (2022) asserted that students will only value learning tools they can grasp and master.

The assessment of the Face Validity of MELC-based Workbook in General Physics 1 in terms of Language Used and Format and Layout by the Respondents

Table 6. *Mean and Standard Deviation on Experts' Assessment of the Face Validity of the MELC-Based Workbook in General Physics 1 in terms of Language Used, Format and Layout and Level of Difficulty.*

Face Validity	*Experts*			*Teachers*			*Students*			*Total*		
	M	**DES**	**SD**	**M**	**DES**	**SD**	**M**	**DES**	**SD**	**M**	**DES**	**SD**
Language Used	4.17	A	0.65	4.75	SA	0.40	4.52	SA	0.57	4.48	A	0.58
Format and Layout	4.29	A	0.64	4.83	SA	0.38	4.44	A	0.51	4.52	SA	0.57

Table 6 disclosed the assessment results on the face validity of the MELC-based workbook in terms of the language used and format and layout by the groups of experts, teachers handling General Physics 1 and Grade 12 STEM students. As gleaned from the table, the respondents rated with an average mean of 4.48 and standard deviation of 0.58 for the language used and with an average mean of 4.52 and standard deviation of 0.57 for format and layout. As a result, the language used was described as "agree" and the format and layout are described as "strongly agree." This data imply that the three groups of respondents believed that the MELC-based workbook in General Physics 1 has met the standards of a workbook in terms of the language used and format and layout. This further implies that the readers or users of the workbook have found the learning material to be appropriate in terms of the vocabulary applied in presenting the lessons, exercises, and other activities. In addition, they have also found the layout of the material to be suited and appropriate vis-à-vis the level of the readers.

Accordingly, the ratings of the teachers handling General Physics 1 on the language used and format and layout of the said workbook obtained the highest ratings, as revealed by their means of 4.75 and 4.83, with standard deviations of 0.40 and 0.38, respectively. Thus, all the indicators both in language and format and layout were described as "strongly agree". The ratings signify that the teachers are very much in favor of the MELC-based workbook in General Physics 1 being used as instructional material as far as these aspects were concerned. It can be inferred that the experts, teachers handling General Physics 1, as well as the students perceived that the MELC-based workbook was incorporated to contain suitable and appropriate language vis-à-vis the level of the target learners.

The assessment by the Expert Group and the Teachers Handling General Physics 1 on the Face Validity of the MELC-based Workbook in General Physics 1 in terms of the Level of Difficulty

The study further determined the level of difficulty of the MELC-based workbook as perceived by the expert group and teachers handling the General Physics 1 subject. Table 7 shows the results of the average mean and standard deviation of the face validity of the workbook in terms of the level of difficulty which is 4.39 described as "agree" and 0.73, respectively. This implies that the experts and the teachers perceived

the level of difficulty in the MELC-based workbook to be acceptable and tolerable to the target level of learners. The results clearly indicate that the expert group and the teachers believed that the MELC-based workbook is appropriate and helpful to the learners. They were also convinced that the workbook is responsive concerning the need for learning material that is suitable based on the level of skills and knowledge of the learners. Thus, using the workbook, the learners may find the material not only understandable, but also, an appropriate resource to enhance their skills and knowledge in General Physics.

Table 7. *Mean and Standard Deviation on the Assessment of the Face Validity of the MELC-Based Workbook in General Physics in terms of Level of Difficulty by the Experts and Teachers.*

Face Validity	***Experts***			***Teachers***			***Total***		
	M	**DES**	**SD**	**M**	**DES**	**SD**	**M**	**DES**	**SD**
Level of Difficulty	4.12	A	0.79	4.67	SA	0.59	4.39	A	0.73

The study's findings are in agreement with Rongayan, Jr. and Dollete's (2019) study, which demonstrated that the physical science workbook designed for senior high school students was well-received and validated by experts. The study's results are also comparable to Auditor and Naval's (2014) study, which found the created modules to be acceptable for 10th-grade physics students. Moreover, the findings of the study align with previous research by Inocencio and Calimlim (2021) which recommended the use of their workbook by Grade 8 Science teachers to improve students' performance and scientific literacy. This is also in line with the idea that instructional materials can help teachers deliver lessons effectively and make learning more accessible to students (Isola, 2010). Abdu-Raheem (2014) also showed that instructional materials are useful in clarifying concepts and making subject matter understandable to students. The results are similar to the findings of Monding and Bunel (2021), who found that the worksheets were effective in teaching basic science concepts and appreciated by students, leading to an improvement in their performance. The results are also consistent with the study of Cajayon and Benavides (2022), which concluded that the learning activity sheets contributed to the development of soft skills, such as creativity, communication, teamwork, and responsibility. Additionally, the results match the findings of Catuday (2019), who found that the laboratory workbook was well-formatted, easily understandable, and met the evaluation standards set for its target audience.

Conclusion and Recommendations

The components of the developed MELC-based workbook in General Physics 1 for senior high school provided significant inputs for the development of the MELC-based workbook that is responsive to the requirements of the Department of Education, particularly on the subject. Generally, the content and face validity of the workbook have met the requirements necessary for the acceptability of the learning material from the users' point of view. However, results do not speak of high quality and outstanding output; and therefore, require further improvement and revision. The varying perceptions of the experts, teachers, and students clearly indicate that the workbook did not satisfy some aspects which the respondents hoped to have addressed. The teachers handling General Physics 1 are more lenient in rating the face validity of the MELC-based workbook, in terms of the language used and

the layout compared to the expert group and the Grade 12 STEM students. The level of difficulty of the MELC-based workbook in General Physics 1 for senior high school is just appropriate vis-à-vis the level of learners. Nevertheless, since there were varying perceptions, the workbook has some gray areas and lapses that need to be reviewed further.

The MELC-based Workbook in General Physics 1 may be published and used by teachers as well as students at senior high schools offering STEM strand. The MELC-based workbook in General Physics 1 may be used as one of the instructional or supplementary materials in teaching General Physics 1 for senior high school students under STEM strand. The school, district, and school division offices may intensify the conduct of workshops and training on the development of contextualised workbooks or instructional materials even in other subject areas, especially in senior high school subjects. Areas needing improvement in the developed workbook may be subjected to further review or revision. Other studies may be conducted to determine which areas in the workbook have resulted in differed perceptions of the respondents. Furthermore, studies may be conducted by future researchers on the effectiveness of the MELC-based workbook in General Physics 1 for senior high school.

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