

# Development of Android-Based Strategic Intervention Material for Science 6

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## ABSTRACT

This study was conducted to put forward the development of an Android-based Strategic Intervention Material (SIM) that addresses the least mastered competency in the first quarter of Science 6. Both qualitative and quantitative approaches were employed in this study using purposive sampling technique. Key informant interview was used to identify the least mastered competency. A focus-group discussion was also conducted to validate and triangulate the gathered data. Meanwhile, descriptive statistics were used to determine the level of acceptability of the intervention material. Four (4) expert evaluators were also tapped to assess and validate the practical utility and acceptability of the SIM. Results revealed that the recurring least mastered competency for the first quarter is on “classification of the different types of colloids”. Utilizing the ADDIE model, an Android-based SIM was developed. The level of acceptability for implementation of the Android-based SIM generally appeared as “good” in terms of technical, instructional, activity, content and significance. Hence, it is recommended that teachers should venture into designing intervention materials that are technologically assisted. Moreover, future studies may explore on assessing the effectiveness of the Android-based SIM in improving students’ performance on the identified least mastered competency.

**Keyword:** ADDIE, Android-based (SIM), least mastered competency

## INTRODUCTION

Teachers in all parts of the world are unanimous in considering least mastered competencies as one of the major causes of learning gaps in the classroom. When students fail to acquire a specific skill and meet a particular learning standard, teachers are expected to innovate and do something to bridge the gap. If left unaddressed, learners may struggle not only in their academic life but also in various aspects of their lives. Nowadays, several strategies are being employed by the teachers specifically in their choice of learning intervention materials to better reinforce the lesson. However, even with the teachers’ creativity and innovativeness, learners continue to perform low and achieve poor in academic performance. This is now the challenge that teachers must embrace, creating not just a mere intervention material but one that is in accordance with the learners’ interest and learning style.

Instructional materials are utilized by teachers in the classroom to help achieve desired learning objectives. According to Tety (2016), instructional materials have been considered as an effective strategy to make effective teaching and learning happen. Instructional materials here include all the tools that the teachers can use to make the learning more interesting and memorable. Similarly, Samuel (2009) on his study on the importance of instructional materials in Nigeria stated that classroom teachers are expected to be conversant with the type of instructional materials used in the teaching learning process. He further elaborated on the essence of producing instructional materials which is to facilitate the teaching learning process and not to use such instructional materials as objects of decoration in the classroom or as objects to be presented during award winning national exhibitions on improved instructional materials. For the learner, instructional materials offer a high degree of relevance for they provide a reality of experience that promotes pupils' self-activity and independence in learning. The same study recommended that for an instructional material to be effective, it should be usable and not so complicated. Moreover, it was recommended that instructional materials must make learning more real and meaningful to the learner.

In the Philippines, a study conducted by Salviejo, Aranes and Espinosa (2016) on the effect of Strategic Intervention Material (SIM) in Science revealed that the use of SIM is effective in terms of improving students' performance and learning approach. The positive result of the survey suggested that the SIM was appreciated and appealed to both types of learners being studied in their research. Likewise, a study by Alboruto (2017) revealed that the employment of SIM was effective in utilization of strategic intervention materials in handling large classes in terms of improving science process skills and mastery of science concepts. Sharing the same idea with the authors above, Pasion (2019) stated on his study that understanding the essence of instructional materials in the learning of the students is equivalent to a lesson well-delivered. He accentuated that innovative teachers allow their students to experience different ways of learning therefore facilitate the varied and distinctive learning styles and needs of the students.

Interestingly, a study conducted in Davao City revealed that the use of Strategic Intervention Materials could not cater to all the learning preferences of the diverse learners (Batino, 2017). This means, that not all learners learn best with the use of the material. She further explained that visual nature of the SIM may not be suitable to the learners having learning preferences such as musical, bodily kinesthetic, interpersonal and others. However, the author still recommended that in order to improve students' learning, teachers must adhere to learner-centered strategies and can make use of the SIM to facilitate learning.

Needless to say, the crucial role of the teachers and their innovativeness in terms of creating the best intervention material that can better reinforce learning inside the classroom is not just an option nowadays, given the poor academic achievement of our learners. It has therefore become necessary for teachers to innovate on ideas and techniques on how to better help the learners who are struggling in a specific learning competency. With the reality of having more and more teachers creating intervention materials nowadays but still struggling in improving learner achievement, this study is necessary in addressing this issue. In the context and the locale of this study, the researcher found the urgency to investigate on this concern to finally pinpoint what else could be the underlying problem why despite the effort of the teachers, learners continue to perform low. Furthermore, issues regarding the competence of teachers to create an appropriate Strategic Intervention Material may also be explored in this study which will also serve as an avenue to assess and evaluate what else should be done in order to address the problem.

The researcher therefore feels the importance of looking into the underlying issues related to addressing the least mastered competencies in Science 6. Additionally, the researcher rarely comes across with a similar study especially in the local setting wherein an intervention material will be created based on the teachers' view on what the students really need.

## REVIEW OF RELATED LITERATURE

This section presents the related literature and studies after thorough and in-depth readings done by the researcher. The information presented in this section provides solid background for the conduct of the study on the development of Android-based Strategic Intervention Material.

### Least Mastered Competency in Science 6

Division Memorandum No. 738, s. 2019 stipulates that as part of the continuing efforts of the Division to improving the implementation of the K to 12 Basic Education Program (BEP) in Science, classroom interventions are encouraged. The said memorandum contains the list of least-learned competencies in Science based on the submitted quarterly reports of the elementary school districts. Hence, all the science teachers are encouraged to implement intervention programs such as the development of Strategic Intervention Materials. The goal is to help the learners master the identified least-learned competencies and consequently improve the academic achievement of the learners. Further, science teachers are tasked to track and monitor the progress of the students toward mastery of competencies.

Most clearly, least mastered competencies are the specific competencies in a subject area wherein students fail to achieve its required level of mastery. DM No. 738, s. 2019 specifically noted that Science adheres to the National Achievement Test (NAT) Standards on determining the mastery level of learners. Those competencies which only

has 15% and below in the percentage of correct response are considered least mastered. Additionally, the said memorandum reveals all the least- learned competencies in Science for school year 2018-2019.

Along this vein, De Jesus (2019) underscored that inclusive learning is one of the thrusts of the K to 12 Basic Education Curriculum. This thrust ensures that all learners are given the equal opportunity to develop through varied learning opportunities at their own pace. Further, he noted that the National Achievement Test (NAT) results in our country give a rough estimate of student performance in schools. Sadly, in standardized testing, learners tend not to reach their full potential and underperform. To elaborate, the author mentioned that the Grade 9 Science First Quarter Examination MPS from SY 2015-2018 also have low performance with scores 51.35, 53.26, 48.60, and 53.09 respectively. Clearly, this shows the lack of content mastery of the lessons and indicates academic failure. Accordingly, academic underachievement is a matter that needs great attention since it primarily prevails at all levels of ability (Gillies, 2008).

Likewise, Batino (2017) mentioned in her study the Trends in Mathematics and Science Survey (TIMSS) that was conducted years ago which revealed unsatisfactory results. Philippines ranked 41<sup>st</sup> in Math and 42<sup>nd</sup> in Science out of 45 countries. This proved that vast majority of Filipino students have performed way below par in all national achievement tests and below the levels of most students from other countries in the international tests.

With this is the birth of countless efforts to address problems related to student poor performance. The results of the study conducted by De Jesus (2019) on improving least mastered competency in Science using Electronic Strategic Intervention Material (E-SIM) revealed a significant increase in post-test scores of the student respondents which means the intervention applied was indeed effective. Hence, as a recommendation of the study, further conduct of research on the use of E-SIM in other subjects to validate the impact of E-SIM in educational results is suggested.

Due to its positive effect, more studies on the positive impact of E-SIM are being conducted. A similar study on improving least mastered competency using electronic intervention material was also conducted by Antonio, Bautista and Bayona (2017). Their study had proven the effectiveness of their material in improving students' least mastered competency. Furthermore, student-participants highly favored the use of e-SIM in learning science concepts. In this context, researchers suggest the continuous use of e-SIM as a digital method in teaching science lessons and enhancing the least mastered skills of students.

Meanwhile, in Davao City Division, public elementary school teachers religiously monitor the least mastered competencies of all learners in all subjects. This is done immediately after the conduct of quarterly exams. In particular, science teachers identify which among the competencies taught for a particular quarter is the most difficult for the learners. After identifying the competencies, the specific learners who least mastered the competencies will be labeled as "pupils at risk" especially if their performance is recurring and already alarming. Hence, in order to address the learning gap, teachers conduct remediation among these learners using various learning intervention materials. For a few years, the use of Strategic Intervention Material (SIM) has been used widely in the Division of Davao City and several studies have already proven the effectiveness of the material. However, students in the classroom continuously lag behind and the danger of widening the learning gap is still at hand.

More specifically, DM No. 738, s. 2019 clearly listed all the least learned competencies in Science from Grades 3 to 11. For grade 6, it appeared that the competency, classify the different types of colloids such as aerosols, foams, gel, sol and emulsion is a recurring least mastered competency for the first quarter. It clearly shows then that despite the use of SIM in teaching this competency, there is still a problem lying somewhere as the mentioned competency appears to be recurring as per record.

Technically speaking, Novilia, Iskandar and Fajaroh (2016) conducted a study on a certain approach in order to improve the cognitive learning outcome of students on the concept of colloid. The authors stated that colloid is one of the chemistry topics taught in high school. The basic competence of Colloid topic is to analyze the role of colloid in life based on its characteristics (Ministry of Education and Culture, 2013). Rohma (2013) stated that in the Colloid topic, students are generally compelled to memorize its content, even though students can get any kind of learning sources. The memorizing method produces numerous misconceptions. This is affirmed by Trigunarti

(2008) who said that there were several misconceptions in Colloid topic, such as: students assume that solution is a mixture which is composed by kinds of substances and water; solution is always thin; and colloid is always thick. In support to the authors previously mentioned, Purtadi & Sari (2011) found several misconceptions in the Colloid topic as well. These are the concept on colloid precipitates; colloid is solid; solution always dilutes; and solution is a mixture of matter and water.

Hence, the concept on utilization of appropriate intervention material becomes very important in dealing with least mastered competencies, especially the recurring ones. Theoretically, instructional intervention is a specific program or set of steps to help students improve in an area of needs and help them get better at things they are struggling with as students can have many different types of needs. According to Lee (2020), even though instructional interventions are formalized, they can be flexible, too. Instructional intervention can involve strategies. Lee (2020) however was clear in making his point that not all of the techniques are called interventions. The key difference is that the training intervention is formalized, directed at a known need, and controlled. A technique, on the other hand, may be casual and is not often followed up.

Meanwhile, teaching materials refer to the resources that the teachers utilize to deliver instruction. Teachers make use of this to support student learning and increase student success. Preferably, these teaching materials should be tailored to the content in which they are being used and to the students in whose class they are being used (Ministry of Education, 2020). Teaching materials come in many shapes and sizes, but they all have in common the ability to support student learning. Primarily in lower grades, learning materials act as a guide for both the teacher and student.

In the Philippine education system, intervention materials are highly regarded as tools for remediating poor achievements of the learners. SIM or Strategic Intervention Material refers to a teaching aid introduced into the teaching methods to stimulate the activity of the students and thereby increased their level of understanding (Dy, 2011). It is strategically prepared and structured to teach remediation to low-level attainers in the subject. Students who have not been able to comprehend the concepts of the subject are given daily classroom instruction (Salviejo et al., 2016).

The impact of intervention materials in fostering students' academic achievement in the entire teaching learning process is indisputable much more in addressing least learned topics in the classroom. According to Research Clue (2013), instructional materials assist teachers to make their lessons explicit to learners. They include both visuals and audiovisuals such as pictures, flashcards, posters, charts, tape recorder, radio, video, television, computers, among others. These materials serve as supplement to the normal processes of instruction. Hence, its role and effectivity play a crucial role in promoting learning among learners.

In the teaching and learning process, instructional materials play a very significant role. This improves the learners' memory level. Igiri and Effiong (2015) confirm that the teacher must use relevant instructional resources to make the teaching and learning process more interesting. The authors added that generally agreed by both teachers and school administrators that aside from the chalkboard and textbooks which are the most common materials that the teachers use, there are other materials that help or are able to complement the teacher's effort in the process of learning.

The need to improve the performance of learners in science has always been viewed as a consequence of the lack of facilities and equipment necessary for the subject, according to Escoreal (2012). Science as a topic, through experiments, real life activities and discovery, will provide an opportunity for learners to explore its wonder. The author emphasized that current situations have made learners into a techy- individual- people who prefer to do things with the use of technology. Accordingly, students gave more attention to their teachers who used technology to support their instruction.

Acknowledging the extreme importance of effective instructional material, Omiku (2015) posited that there is a need for schools to support the science teachers in providing necessary equipment and facilities given the fact that Science is a subject which focuses on the advancement of the society and the use of technology to the modern world. If such will happen, this will definitely be a big help for both teachers and the learners in attaining the 21st-century skills such as critical thinking, collaboration, creativity and communication.

## Technology – Assisted Intervention Material

Technology plays an important role in promoting the learning environment of the 21st century by integrating physical and digital arrangements, according to Parmar (2013). This includes online course work, links to external experts, as well as a wealth of online community knowledge. Similarly, Bajana (2019) explicated that technology's relentless development has become a requirement for the success of society. This social change would also be introduced into the classroom as a training ground for learners to be more educated before joining the world of work. The need for improvement in the learning environment is embedded in the Department of Education's goal of delivering quality education to help learners achieve skills and be internationally competent.

On studies comparing traditional and computer assisted intervention materials in teaching acids and bases in Chemistry, Morgil (2003) randomly distributed the student respondents into control and experimental groups and their knowledge on the topic were pretested. After the evaluation, the experimental group received computer-assisted instruction, and the monitored group taught conventional teaching methods for two days. The outcome revealed that students who were taught with computer-assisted instruction performed better compared to those who were not.

Remarkably, Riegel (2016) affirmed that virtual learning might serve as effective instructional support for the learners in attaining the 21st-century skills. She emphasized that this type of learners is fond of the advanced technology and they love to have access in various applications and to explore the modern world through technology. Therefore, if modern technology in school such as virtual learning will be utilized, then students may be having a full interest to participate and might also improve their scholastic performance.

## Development of Android-based Strategic Intervention Material

We live in a world that the mobile technology develops at so fast speed that we have difficulty following. Silver (2019) claimed that in only a few years the mobile market has changed drastically with the advent of smartphones with android system and the number of people that own these kinds of devices is growing at a fast rate especially among young people.

The situation is same in the Philippines. According to a report from Statistica (2020), mobile devices ownership among Filipinos has increased up to 65.3 percent of the total population in 2015 and will accelerate to 70 percent in 2020, as forecasted. This results in a large proportion of the total population, provided that the total population in the country has increased considerably and is estimated to hit some 110 million in 2020.

It is important to note that this may lead to the development of numerous educational applications. According to Suhail (2019) the biggest advantage of smartphone is that learning can be achieved anywhere and at any time without limit, and it can create an effective learning environment for teachers and students. Needless to say, the popularity of smartphone is growing fast and these digital devices represent a new generation of technological tools that offer remarkable access to content as well as opportunities for creative use especially among learners.

Similarly, mobile learning (m-learning) is the freedom to learn anywhere and at any time with convenience through a portable electronic device. The use of digital teaching materials provides a broad source of knowledge in the academic field and also inspires sensitivity in the use of electronic devices such as tablets, cell phones and hybrids (Sari, Suryani, Rochsantining, & Suharno, 2019).

Likewise, Irawan and Djatmika (2016) revealed on their study that the use of android-based instructional materials can increase the performance of the students. Accordingly, materials and media experts report that this educational media draws students to the easiness of their work. From the viewpoint of students, instruction media mobile learning increases the quality and efficiency of learning, strengthens the student spirit and helps to understand learning materials.

This is consonance with the statement of Gan, Menkhoff and Smith (2015) that the instructional media intends to assist teachers presenting the materials to their students. Further, Vebrianto and Osman (2011) stressed that teachers can implement it to avoid boredom during the class and to increase student learning outcomes. These materials should be in accordance with the needs of the learners.

Without a doubt, the development of Science and Technology brings impact toward several aspects of life including education such as the existence of gadget, such as smartphone and tablet, is useful to support daily activity in society (Tan, Hsiao, Tseng & Chan, 2018).

The above cited literature strongly suggests the prevalence of the eminent problem on recurring least mastered competencies among students. Learning gaps among learners present a very serious problem when it comes to the development of teaching- learning process. More specifically, the science teachers' experiences in teaching the subject and the teaching strategies that they commonly practice clearly exhibits that despite the effort in ensuring the best quality education in various ways such as utilization of learning intervention materials, still, there seems to be a problem since learners continue to perform poor in their academic endeavor. Moreover, the literature above presents a learning a competency in science in which learners commonly fail at. Hence, the development of a material that is technology-inclined is also discussed with its benefits to improving learning among students. Hence, the conduct of this study was necessary to provide more literature and reveal helpful ideas in addressing the problem.

## THEORETICAL FRAMEWORK

Educational researchers have developed various theoretical frameworks for technology integration in the classroom. This study is founded upon theories that serves as the backbone of this study.

This study was anchored on the ADDIE Model as an instructional design. Educators and instructional designers have used this model as a framework in designing and developing educational and training programs. ADDIE stands for Analyze, Design, Develop, Implement, and Evaluate. Kurt (2018) enumerated the stages of the model and claimed that educators, instructional designers and training developers find this approach very useful because having stages clearly defined facilitates implementation of effective training tools. In this model, the Analysis phase can be considered as the "Goal-Setting Stage" ensuring that what the student already knows is not duplicated. The Design stage determines all goals, tools to be used to gauge performance, various tests, subject matter analysis, planning and resources. In the Development stage, designers make use of the data collected from the two previous stages and use this information to create a program that will relay what needs to be taught to participants. The Implementation stage reflects the continuous modification of the program to make sure maximum efficiency and positive results are obtained. The last stage of the ADDIE method is Evaluation in which the project is being subjected to meticulous final testing regarding what, how, why, when of the things that were accomplished of the entire project.

Moreover, this study was supported by the TPACK Theory which stands for Technological, Pedagogical, Content, Knowledge, a model written by Punya Mishra and Matthew J. Koehler in 2006 (McGraw Hill, 2020). The theory was developed to explain the set of knowledge that teachers need to teach their students a subject, teach effectively, and use technology. Keeping technology as a separate information set creates challenges, but when we grasp the TPACK structure, we can incorporate technology into the content and pedagogy of our classrooms. Integration will allow our students to learn more effectively. Mishra and Koehler propose that TPACK could direct the development of curricula and teacher education. TPACK is focused on three knowledge areas to consider: Technology, Pedagogy, and Content Knowledge. These three important components recognize that all three of these knowledge sets have an impact on each other, that each of them is important, and that in order to have an effective learning environment, we need to consider all three.

Another vital theory upon which the foundation of this study is built on is the Technology Acceptance Model (TAM). TAM has been one of the most influential models of technology acceptance, with two primary factors influencing an individual's intention to use new technology: perceived ease of use and perceived usefulness (Chittur, 2009). Accordingly, an older adult who perceives digital games as too difficult to play or a waste of time will be unlikely to want to adopt this technology, while an older adult who perceives digital games as providing needed mental stimulation and as easy to learn will be more likely to want to learn how to use digital games.

Finally, this study was founded on the Dual- Coding Theory proposed by psychologist Allan Urho Paivio. According to the dual-coding theory, people's brain obtains information mainly through visual and auditory channels; people accumulate knowledge through processing, organizing and utilizing visually coded information

and encoding spoken language (Pappas, 2014). This theory suggests that if one can obtain a similar amount and size of information, intertwine and interact through both visual and auditory channels, his or her learning can become much more successful. In the field of education technology, the principle of dual-coding is more applied to multimedia learning and information-processing science.

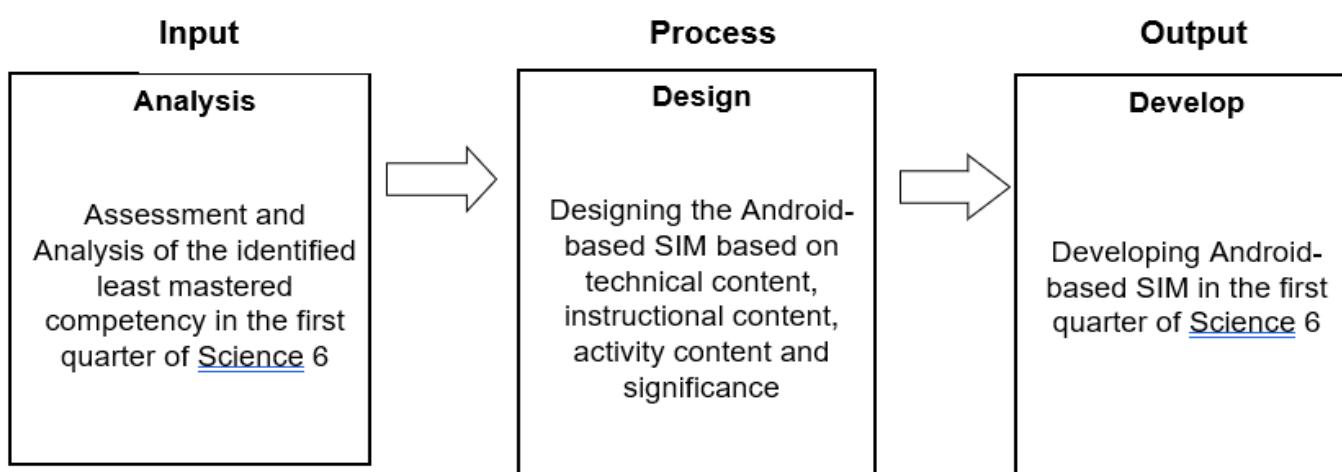
## CONCEPTUAL FRAMEWORK

Figure 1 below shows the conceptual framework of the study utilizing the IPO Model or Input-Process-Output pattern employing the ADDIE Instructional design.

Clearly, the framework below shows the first three stages of the ADDIE Model. The Analysis stage of the study served as the Input which includes the assessment and analysis of the identified least mastered competency in the first quarter of Science 6. Meanwhile, the Design stage served as the Process of the study which includes designing the material based on technical content, instructional content, activity content and significance. Finally, for the Output, the third stage of the model is reflected which is Develop. At this stage, the researcher had already developed the material.

Apparently, the last two stages of the ADDIE model were not undertaken in this study. It is worth noting that for this research, the researcher ended after the development of the material and allowed teacher experts to measure its acceptability for implementation.

Figure 1. The Conceptual Framework of the Study



## Statement of the Problem

The main thrust of this study is to identify the least mastered competency in the first quarter of Science 6 and develop an Android-based Strategic Intervention Material (SIM) for the grade six students at Don Juan dela Cruz Central Elementary School.

Specifically, it sought to answer the following questions:

1. What is the least mastered competency of students in the first quarter of Science 6?
2. What appropriate design can be developed based on the identified least mastered competency?
3. What intervention material could be developed based on the identified least mastered competency?
4. What is the level of acceptability for implementation of the developed Android-based Strategic Intervention Material in the perspective of teacher experts in terms of:
  - a. technical quality;
  - b. instructional quality;
  - c. activity content; and
  - d. significance?

## Assumptions of the Study

The key informants clearly identify the least mastered competency in the first quarter of Science 6. Their responses lead to the development of an appropriate instructional material addressing the identified recurring least mastered competencies in the first quarter of Science 6.

## METHOD

Presented in this chapter are the methods and procedures by which the researcher employed in the conduct of this study on the development of Android-based Strategic Intervention Material (SIM). The research design, participants, sampling design, research instruments, data gathering procedure and data analysis are found in this section.

### Research Design

This study utilized both the qualitative and quantitative research design. Mixed methods research is an approach to inquiry that combines or associates both qualitative and quantitative forms. It involves both collecting and analyzing quantitative and qualitative data. Mixed method design provides researchers, across research disciplines, with a rigorous approach to answering research questions (Immonen, 2011). The use of qualitative design was evident in the conduct of FGD to triangulate the least mastered competency in the first quarter of Science 6 from the perspective of the science teachers who served as the key informants of the study. Meanwhile, the quantitative design was employed in measuring material's level of acceptability for implementation with the teacher experts as the evaluators.

Further, the study adopted the ADDIE model which contains 5 phases: (1) Analysis, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation.

However, it is important to note that the last two stages of the ADDIE model were not undertaken in this study due to the occurrence of the pandemic. The Analysis, Design and Develop stages were successfully done by the researcher. The Analysis stage of the study includes the assessment and analysis of the identified least mastered competency in the first quarter of Science 6. The Design stage includes designing the material based on technical content, instructional content, activity content and significance. Finally, the third stage of the model, Develop, was undertaken by the researcher. At this stage, the researcher had already developed the material and had it ready for its measurement on the level of acceptability for implementation in the future, with students as the end users.

### Participants of the Study

The participants of the study were the four (4) Science 6 teachers of Don Juan dela Cruz Central Elementary School; one (1) School Science Coordinator and three (3) grade 6 science teachers. These teachers served as the key informants in the conduct of the FGD wherein the identified least mastered competency was triangulated in their perspective. Also, during the FGD, the key informants revealed and shared their suggested intervention material which is the Android- based intervention material.

Moreover, for the measurement of the material's level of acceptability for implementation, another set of four (4) teacher- experts in the field were the respondents composed of one (1) school science coordinator with doctorate degree, one (1) master teacher, one (1) science teacher with master's degree and one (1) school ICT coordinator. They evaluated the material's acceptability for implementation based on the indicators in the instrument for the quantitative data which are the technical content, instructional content, activity content and significance of the material.

### Sampling Design

This study utilized the purposive sampling design. This type of sampling is a form of non-probability sampling in which decisions concerning the individuals to be included in the sample are taken by the researcher, based upon a variety of criteria which may include specialist knowledge of the research issue (Oliver, 2013).

In this research, four (4) Science 6 teachers were the key informants during the FGD and another set of four (4) teachers for the evaluation of the material's level of acceptability for implementation. They were considered as the best sources of information in relation to teaching least mastered competencies in Science 6.

## Research Instruments

In order to gather the qualitative data, the researcher utilized a researcher-made interview guide. In order to ensure that the instrument can measure what it is intended to measure, its validity was checked. This was done by presenting it to a group of experts. Their comments and suggestions were integrated in the said instrument. Validity in qualitative research means the extent to which the data is plausible, credible and trustworthy and thus can be defended when challenged (Bashir, Afzal, & Azeem, 2008). The instrument was made based on the context presented in the statement of the problem/ research objectives. The interview guide was crafted to gather data on identifying the least mastered competencies in the first quarter of Science 6. Most importantly, the interview guide was able to draw out the science teachers' perspective on the best and the appropriate Strategic Intervention Material for the identified competency.

Meanwhile, for the quantitative data, a modified adopted questionnaire as evaluation tool was utilized by the researcher. This was used to collect the necessary data of this study. The questionnaire was modified based on the guidance of expert views and recommendations in order to measure the acceptability of the material for implementation. The instrument is composed of four (4) indicators. The first indicator is the Technical Quality with twelve (12) items. The second indicator is the Instructional Quality with ten (10) items under it. The third indicator is the Activity Content with ten (10) items. The fourth indicator is on the Significance of the material with seven (7) items. Further, the four (4) teacher-experts were the respondents of this research instrument in measuring the material's acceptability for implementation.

The Likert Scale below was used to analyze the result of the data generated for the variable in the study.

Scale	Range of Means	Descriptive Level	Interpretation
5	4.50 – 5.00	Strongly Agree	This indicates that the developed Android-based Strategic Intervention Material is excellent for implementation.
4	3.50 – 4.49	Agree	This indicates that the developed Android-based Strategic Intervention Material is good for implementation.
3	2.50 – 3.49	Uncertain	This indicates that the developed Android-based Strategic Intervention Material is fair for implementation.
2	1.50 – 2.49	Disagree	This indicates that the developed Android-based Strategic Intervention Material is poor for implementation.
1	1.00 – 1.49	Strongly Disagree	This indicates that the developed Android-based Strategic Intervention Material is very poor for implementation.

## Data Gathering Procedure

In gathering the data needed in this study, the researcher executed the following steps:

Asking Permission to Conduct the Study. The researcher sought permission first from the Schools Division Superintendent (SDS) of Davao City to conduct the study on the development of the Android-based Strategic Intervention Material. Once granted, a letter of permission was sent to the Public Schools District Supervisor (PSDS) and then to the school principal of Don Juan dela Cruz Central Elementary School requesting that the conduct of the study will be made in the said school.

Expert Consultation. While the data collection tool was being developed, the opinions of the subject experts were consulted firstly and whether the measurement tool was suitable for the purpose to be used was taken into consideration. In accordance with their opinions and perspectives, necessary arrangements were made in the interview guide for the FGD and the survey questions for the measurement of the material's level of acceptability for implementation.

Orienting the Participants for the FGD. The researcher sought permission from the participants of the study. The ethical considerations were considered, and the participants were clearly informed of their voluntary participation. They were also provided with informed consent process and rest assured that the ethical considerations were maintained in the conduct of the research.

Conducting the Focus Group Discussion. In the conduct of the FGD, teacher- participants were assured of having the interview not to last for too long so that they would not feel anxious about it. In order that the participants would feel comfortable and at ease, they were encouraged to talk freely and need not to worry since their responses would be kept confidential. After the discussion, the participants were reminded that a copy of the transcription will be given to them for verification purposes and for review. Austin (2014) affirmed that the interaction is key to a successful focus group. Sometimes this means a pre-existing group interacts best for research purposes, and sometimes stranger groups. Pre-existing groups may be easier to recruit, have shared experiences and enjoy a comfort and familiarity which facilitates discussion or the ability to challenge each other comfortably. This discussion was guided, monitored and recorded by another interviewer, not the researcher.

Transcribing the Data. It is important to note that for the conduct of FGD, the data that came directly from the participants were recorded through audio recording. After which, the recordings were transcribed verbatim before data analysis began.

Measuring of the Material's Acceptability for Implementation. The researcher personally handed in the questionnaires and explained the research tool and its purpose to the research respondents. The evaluators were given enough time to read, understand and accomplish the tool. Then, the researcher retrieved the evaluation after the respondents have answered all the items.

Tabulating the Data. Finally, the researcher tallied and tabulated all the data gathered from the respondents. The statistical computation was done using Statistical Package for Social Science (SPSS). The statistical results were analyzed and interpreted. With the data, conclusions were drawn and recommendations were formulated based on the findings of the study.

## **Data Analysis**

Since this study utilized both the qualitative and quantitative research design, the data gathered during the conduct of FGD were gathered and transcribed verbatim and were interpreted using the descriptive-interpretive analysis. According to Creswell (2014), in order to create a description of the phenomenon being studied, coding process should be generated. Codes are used to generate small number of themes or categories out of the results of observations, interviews and focus group discussions. Identification of significant themes will serve as the basis for the merging themes which will display multiple perspectives from the participants which were supported by their quotations and other evidences.

Meanwhile, the quantitative part of this study computed the mean to determine the level of acceptability for implementation of the developed Android-Based Strategic Intervention Material for Science 6 while the standard deviation was used to determine the variation of the evaluators' response. The data collected were analyzed using SPSS. This is a comprehensive, integrated collection of computer program for managing, analyzing, and displaying data (Noels, 2018).

## **RESULTS AND DISCUSSION**

Presented in this chapter are the results and discussions of the data gathered during the conduct of the Focus Group Discussion. Discussed further is the identified least mastered competency in the first quarter of science 6. Moreover, the quantitative data on the level of acceptability for implementation of the developed Android-based Strategic Intervention Material is also reflected in this section.

### **Least Mastered Competency in the First Quarter of Science 6**

DM No. 739, s. 2019 emphasizes the continuing efforts of the Division to improving the implementation of the K to 12 Basic education Program (BEP) in science. With this is the emphasis on the implementation of classroom interventions.

The participants in this study were able to identify the recurring least mastered competency in the first quarter of Science 6. It was found out the competency on classification of the types of colloids is the competency that the learners are always having trouble with. Moreover, the researcher was able to draw out suggestions from the participants as to what they think is the best and the appropriate strategy and strategic intervention material to address the problem. Teachers were undivided in their perspective that a technology-assisted learning intervention material must be used, hence, the development of Android-based Strategic Intervention Material.

Presented below is the matrix on the Identified Least Mastered Competencies in Science 6 and the corroborated responses of the science teachers in their preferred Strategic Intervention Material.

Themes	Participant 1	Participant 2	Participant 3	Participant 4
<b>Least Mastered Competency in the First Quarter of Science 6</b>				
Identified Least Mastered Competency in Science 6	I have noticed they find it difficult to comprehend when the lesson uses too technical words, words that their mind can't understand yet.	Stars, Planets and Solar System In the first quarter, colloids and their characteristics	There are really topics that just keeps on recurring every year	Those topics that need memorization.
	Well, in grade 6, this is phenomenal, in the first quarter, it is always the discussion on colloids. To be specific, as per my record, the classify the types of colloids as aerosols, foams, gel, sol and emulsion.	First quarter? Mixture po. In particular the colloids. Colloids and their characteristics.	I agree with Ma'am. Colloids in the first quarter. I don't know why students really find it hard.	Colloids in the 1 <sup>st</sup> quarter. Second quarter, the circulatory system. Third quarter is transformation of energy and the fourth quarter is on the solar system.
Development of Android-based SIM	I always believe that the learners of today learn better with their line of interest and learning style. Obviously, students nowadays are into computers and amazingly, they learn better in this avenue. So, why not use this platform in reinforcing the lesson, right	Pupil should have access to "experiencing" lessons like in the Science Tech Fair where pupils enter an air-conditioned tent where they are presented with a different kind of power point presentation..	I agree. Something that they can save in their cellphones since everybody has phones nowadays. Especially here in our school. Although not all have phones, but majority has.	I think integrating games in our remedial activities will be effective. I mean the digital games, this is what they will like.

Participant 1 generously shared her experience on possible reason why students fail to master a certain competency.

"I have noticed they find it difficult to comprehend when the lesson uses too technical words, words that their mind can't understand yet. That is why, as much as possible, we use simpler terms, words that they can understand so that they won't lose the momentum in learning."

#### **Participant 3 also noted:**

"It depends per quarter. But there are topics nga balik balik na lang gyud every year." (There are really topics that just keeps on recurring every year.)

These statements are in consonance with De Jesus' (2020) idea on the relevance of Strategic Intervention Materials (SIM) as a form of remediation to increase the academic achievement of low-performing learners in addressing this problem in schools.

The participants of this study did confirm that the recurring least mastered competency in the first quarter of Science 6 is the competency; classify the types of colloids as aerosols, foams, gel, sol and emulsion. Participant 1 was clear in saying:

“As the Science Coordinator for 5 years, it is my task to consolidate data on the least mastered competencies in Science at various levels. Well, in grade 6, this is phenomenal, in the first quarter, it is always the discussion on colloids. Students do not like them.”

This is further confirmed in the memorandum issued by Davao City Division, DM No. 738, s. 2019. The said memorandum listed the competency classify the types of colloids as aerosols, foams, gel, sol and emulsion as the recurring least-learned competency in the first quarter of Grade 6 for three consecutive years.

Moreover, in this study, it is recognized by the teacher-participants that most of the identified least mastered competencies are recurring. This leads them to a realization on what else could be done in order to address the problem.

Participant 1 was quick to share her idea:

“I always believe that the learners of today learn better with their line of interest and learning style. Obviously, students nowadays are into computers and amazingly, they learn better in this avenue. So, why not use this platform in reinforcing the lesson, right.”

#### **Participant 4 agreed by saying:**

“As I have mentioned a while ago, Ma’am. I think integrating games in our remedial activities will be effective. Digital games ha. Mao ni ilang gusto.” (I mean the digital games, this is what they will like.)

#### **Participant 3 also added:**

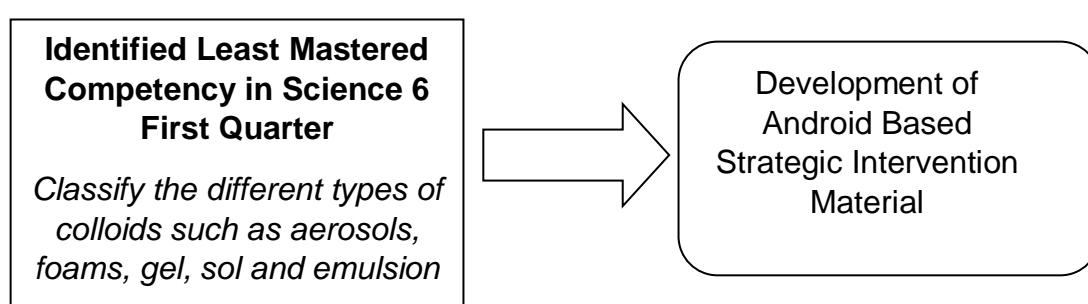
“I agree. Something that they can save in their cellphones since everybody has phones nowadays. Especially here in our school. Although dili tanan, at least ang majority.” (Although not all have phones, but majority has).

The suggestions of the participants are in line with the assertions of Suhail (2019). According to him, the biggest advantage of smartphone is that learning can be achieved anywhere and at any time without limit, and it can create an effective learning environment for teachers and students.

### **Thematic Map of the Study**

Identifying the least mastered competency in the first quarter of Science 6 was triangulated with the conduct of the FGD with the science teachers as key informants. The narratives were transcribed according to the thematic findings illustrated below.

Figure 2. Thematic Findings of the Study



## The Employment of ADDIE Model in Designing an Intervention Material

The conduct of this study on the development of Android-based SIM for Science 6 was made possible through the employment of an appropriate design aimed to create an intervention material. This intervention material intended to address least mastered competencies in the first quarter of Science 6, in particular the classification of different types of colloids.

The ADDIE Model is a process utilized by instructional designers and training developers (Instructional Design, 2020). The model consists of five phases: Analysis, Design, Development, Implementation and Evaluation. These stages work together to represent a dynamic, flexible guideline for building effective training and performance support tools. Moreover, it is important to note that the sequence does not impose a strict linear progression through the steps. Kurt (2018) asserted that educators consider the approach effective because having stages clearly defined facilitates implementation of effective training.

In the context of this study, the researcher found the utilization of the model very helpful in the development of an intervention material. This enabled the researcher to identify the least mastered competency in the first quarter of Science 6 through careful and systematic analysis at the beginning of the study. After the analysis stage, with the help of the participants, designing the material was undertaken. In the designing stage, the comments and the suggestions of the participants were considered:

### **Participant 1 shared:**

“I always believe that the learners of today learn better with their line of interest and learning style. Obviously, students nowadays are into computers and amazingly, they learn better in this avenue. So, why not use this platform in reinforcing the lesson, right?”

Participant 3 also affirmed by stating the importance of designing an appropriate intervention material:

“That is why, as educators, we need to be able to develop and design a material that is in line with this interest. Therefore, producing the material is not enough. Carefully designing it is a must.”

Hence, the researcher took into consideration the crucial role of developing an intervention material that should be appropriate and effective to the learners. The employment of ADDIE model contributed to the successful development of the material as the stages of analysis and designing were highlighted to be very important part of the process.

## **The Development of Android-based SIM for Science 6**

The participants' generous sharing of their ideas and suggestions to address problems related to the least mastered competencies in the first quarter of Science 6 enabled the researcher to develop an Android- based Strategic Material.

Participant 4 was adamant in her suggestion of the kind of material that should be provided to the learners:

“I think integrating games in our remedial activities will be effective. I mean the digital games, this is what they will like.”

Participant 2 also enthusiastically agreed by saying:

“Nowadays, teachers are asked to make a Strategic Intervention Material. Why not make a SIM that is technology-based? Something that can be stored in their cellphones. I think students will like that.”

After meticulously considering the suggestions, the researcher was able to arrive into the development of an Android-based Strategic Intervention Material. The researcher believes that the use of mobile platform for educational purpose will help the students to access the material anywhere. Simply put, it is the ‘mobile’ aspect

of this type of material which makes it different from the other types of learning as mobile devices have features and functionality for supporting learners.

In order to develop an interactive mobile application of Strategic Intervention Material that can be used by the students, ADDIE instructional design model was implemented. However, the last two stages of the ADDIE model were not undertaken in this study due to the occurrence of the pandemic.

The results of each phase of the development of intervention material in this research are shown in this section.

### Analyze Phase

The Analysis stage of the study includes the assessment and analysis of the identified least mastered competency in the first quarter of Science 6 which was the classification of the different types of colloids.

### Design Phase

The Design stage of this study includes designing the material based on technical content, instructional content, activity content and significance. The structure of the material that has been determined, compiled into the android-based learning application based on concept analysis. The results of the entire design phase, namely in the form of a draft android-based learning application. The example of the application shown in the figure below.

**Figure 3.** Screen Design of the Application



Starting with the cover, this cover is the main feature displayed in the learning application. Each unit has a different cover. The second display is in the form of menus consisting of interactive student activities that followed the standard of SIM prescribed by DepED which contains the following: Guide card, Activity card, Assessment card, Enrichment card and Reference card. These activities will engage the students with the information they are learning that will lead them in mastery of the competency. The app also features voice-over narrations on the different activities that the students will take. An additional feature has been added consisting of Pretest/Posttest interactive quiz to show a student's level of understanding. Feedback is given immediately after finishing each question in the test sets. In addition, the questions are randomly selected to prevent rote memorization. Learning style, interests, strengths and weaknesses are taking into consideration during the design phase.

## Development Phase

Since this part of the research is the development work, there were some development tools used in this study.

Game Maker: Studio 2 was used as the Android application development tool. In order to finish the development, an easy used tool Java Development Kit was needed. Android SDK was necessarily used as well. In addition, there were self-made images that were included and inserted in the material. Meanwhile, the Adobe Photoshop was used to process pictures.

At this stage, the researcher had already developed the material and had it ready for its measurement on the level of acceptability for implementation in the future, with students as the end users. The app was published on Google Play Store so that in can be downloaded easily by the students. Using the application, learning is not just restrained to classrooms, or homes. Students can use them anywhere they like.

The figure below are the steps on how to download the developed Android-based SIM on Google Play Store.

Figure 4. Steps on how to download the developed Android-based SIM

### How to download the developed Android-based SIM

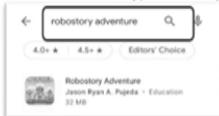
#### Step 1

Open your Android device and tap the **Play Store** icon.



#### Step 2

In the search field, type **robostory adventure**. Tap the full name when it appears.



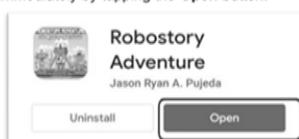
#### Step 3

Tap the **Install** button.



#### Step 4

When the app has downloaded and installed onto your device, you can access the app immediately by tapping the **Open** button.



## Level of Acceptability for Implementation of the Developed Android-based Strategic Intervention Material

The table below shows the indicators under the level of the acceptability for implementation of the Android-based Strategic Intervention Material when analyzed according to technical quality, instructional quality, activity content and significance of the developed intervention material.

Table 1. Level of Acceptability for Implementation of the Android-based SIM

Indicators	Mean	SD	Level of Acceptability for Implementation
Technical Quality	4.48	.55	Good
Instructional Quality	4.4	.68	Good
Activity Content	4.2	.72	Good
Significance	4.57	.53	Excellent
<b>Overall</b>	<b>4.41</b>	<b>.62</b>	<b>Good</b>

As shown in Table 1, the findings reveal that all the three (3) indicators presented obtained the following mean ratings: 4.48 for technical quality, 4.40 for instructional quality, and 4.20 for activity content. Apparently, all of them denote a good level of interpretation.

In particular, in terms of its technical quality, the material generally exhibits ease and convenience to navigate and that its information display, screen display and design are motivating and understandable to the learners. Also, the images and graphics are attractive and appropriate to the lesson. As for the instructional quality, its good level of acceptability means that the material developed includes objectives that are measurable and clearly stated. Further, the material is consistent with facts and information about colloid as well as written with words and terms understandable to the learners. Generally, the instructional quality of the material is good enough that the learners can learn about the concept of colloids and their characteristics according to their own pace. As for the material's activity content, the results revealed a good interpretation which means that the activities embedded in the material are organized and have clear directions. Also, the activities provide examples to concretize the concept, particularly those drawn from real-life experience and assess their understanding of what they have learned as well as provides a variety of exercises and drill for mastery of concepts and skills. Meanwhile, among the four (4) indicators, the indicator significance got the highest mean which is 4.57 with a descriptive interpretation of excellent. Evidently, the material's content is indeed relevant to the lesson and allows the students to apply what they have learned to other subject areas or in new contexts. Most importantly, the material provides learning opportunities for students reinforcing the content of the lesson in real life.

To summarize, the developed Android-based SIM is acceptable enough for implementation as perceived and evaluated by the teacher-experts.

This result is in accordance with the findings of Irawan and Djatmika (2016) on their study on developing instructional media mobile learning based android to improve learning outcomes. Their study revealed that the use of instructional media mobile learning based android did increase the result study of the students. This was supported by Gan, Menkhoff and Smith (2015) with their statements that instructional media intends to assist teachers presenting the materials to their students.

Consequently, Vebrianto and Osman (2011) stressed that teachers can implement it to avoid boredom during the class and to increase student learning outcomes. These materials should be in accordance with the needs of the learners.

## SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This section presents the summary, conclusions drawn from the implications of the data and recommendations of the study.

### Summary

This study was conducted to identify the least mastered competencies in the first quarter of Science 6 and develop an Android-based Strategic Intervention Material. The study employed both the qualitative and quantitative

research design. For triangulation purposes, FGD was conducted with the science teachers. Meanwhile, to determine the level of acceptability for implementation of the developed SIM, descriptive quantitative approach was utilized. To summarize, the following are the major findings of this study:

1. The recurring least mastered competency in the first quarter of Grade 6 is: classify the types of colloids as aerosols, foams, gel, sol and emulsion. With this, the participants of this study were in agreement that a learning intervention material that is appropriate to the interest of the learners is needed. In this study, the development of a technology-assisted intervention material was suggested by the teacher-participants.
2. Based on the identified least mastered competency in the first quarter of Science 6, an appropriate design was utilized in the development of the intervention material. In particular, the study utilized the ADDIE Model which stands for Analysis, Design, Development, Implementation and Evaluation.
3. With the employment of the ADDIE Model, the researcher was able to develop a material that is in response to the needs of the learners as recommended by the participants. The Android-based Strategic Intervention Material was developed by the researcher to address the recurring least mastered competency in the first quarter of science 6 which was the classification of the types of colloids.
4. Four (4) teacher-experts in the field of ICT and science as a subject evaluated the material's level of acceptability for implementation of the developed material. The findings generally reveal a good level of acceptability.

## CONCLUSIONS

Based on the findings of the study, the following conclusions are drawn.

1. Classification of the types of colloids as aerosols, foams, gel, sol and emulsion was the identified recurring least mastered competency in the first quarter of Science 6 as identified by the teacher-participants.
2. With the identification of the least mastered competency in the first quarter of Science 6, the utilization of the ADDIE Model paved the way to the development of the Android-based Strategic Intervention Material. The intervention material has been considered helpful to address the identified least mastered competency in Science 6. It was revealed to be in line with the interest of the learners. Learners prefer to use learning resources that are technologically interactive.
3. The use of Android-based Strategic Intervention Material in teaching the competency, classify the types of colloids as aerosols, foams, gel, sol and emulsion can be effective for implementation as perceived and evaluated by teacher-experts in terms of technical quality, instructional quality, activity content and significance of the material.

## RECOMMENDATIONS

Considering the findings and conclusions of the study, the following recommendations are forwarded:

1. Teachers should integrate technology in their strategies and approaches to address the recurring least mastered competency
2. Teachers and researchers will utilize the ADDIE Model in developing a material that is in accordance with the interest and learning style of the learners that are more appropriate, appealing and effective.
3. Utilization of the Android-based Strategic Intervention Material developed in this study is hereby recommended by the researcher.
4. Researchers may do the Implementation and Evaluation phases of the ADDIE Model on the android-based strategic intervention material. Likewise, conduct a quantitative study to determine its impact to the end users.

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