



# HyFlex Learning: Continuing Tertiary Education in a Post – Pandemic Environment

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**Abstract.** The COVID 19 Pandemic experienced by the whole world opened doors to different pedagogical techniques needed to continue the delivery of quality education. Now that COVID cases are continually decreasing, new pedagogies and learning environments are developed or enhanced to cope with changing demands of the educational society. This study aimed to develop and validate a Hyflex – Ready Classroom (HRC) for the course Integral Calculus following the ADDIE Model of Instructional Development. Using the descriptive-developmental research design, the study developed HRC with the instruments of the study answered by the content and pedagogical experts, Mathematics teachers, and students as sources of data. These data undergone descriptive statistics and qualitative analysis to critically analyse the results of the study. The HRC complied with the set criteria for application standards and design solutions as reflected in its components in each unit. The physical components include all facilities and equipment utilized in an HRC. Pedagogical components on the other hand, includes learning materials, learning activities, and assessment to be implemented to the students considering their learning modality. The design and content of the HRC were assessed as very good. The teachers commended the Hyflex – Ready Classroom as it is an innovative strategy in delivering contents in Mathematics in a post pandemic society. The students agreed that the HRC is very favourable since it offers them all possible learning opportunities to acquire skills in Integral Calculus. They claimed that it greatly helped them to understand the concepts in Integral Calculus. They claimed that they enjoyed their classroom discussion whether online or face to face discussions. The use of the HRC provides another innovation in the teaching and learning concepts in Integral Calculus. The test for the effectiveness of the hyflex – ready classroom is encouraged to formally Hyflex Learning to different educational institutions.

**Keywords:** ADDIE Model · Assessment · Development · Integral Calculus · Hyflex Learning

## 1 Introduction

The traditional structure of HE instruction includes in-person classes that are given at predetermined times and places, together with reading and homework assignments that students complete outside of class. Offering online and blended learning as well as

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generally integrating digital technology into teaching and learning have become more popular recently (Araka et al., 2020; Weiser et al. 2018). In the present and the future of higher education, online education is essential (Allen et al., 2016).

The Coronavirus Disease, often known as COVID-19, had a big impact on the nation's educational system. Before the epidemic, the country had been participating in a typical classroom setup where all teachers and students were in a physical classroom. The Philippine educational system at the collegiate level must have a fast transition from a traditional set-up to a distance learning modality by March 2020 due to the sharp rise in COVID cases. Regardless of the type of course or program, different colleges and state universities have recognized and adopted this change in how quality education is delivered. But every adversity and obstacle will eventually end. As there are now very few Covid instances, some universities have begun to reopen their doors and physically admit students, albeit in small numbers. Moreover, according to CHED Commissioner J. Prospero De Vera II in May 2021, "From now on, flexible learning will be the norm. There's no going back to the traditional full-packed face-to-face classrooms. The commission has adopted the policy that flexible learning will continue in the school year 2021 and thereafter". This statement calls for the integration and implementation of Hyflex Learning.

Hyflex learning is defined as learning that integrates complementary face-to-face (synchronous) and online learning (asynchronous) experiences in service of intended learning objectives, according to Columbia Center for Teaching and Learning (2022). In a hyflex course, each student is required to complete the same mix of online and in-person assignments. In contrast, HyFlex is "flexible" in that it gives students a choice in how they participate in the course and interact with the content, allowing them to choose whatever method suits them best during the duration of the course and from session to session.

Additionally, according to the University of Florida Center for Instructional Technology and Learning (2022), instructors who use HyFlex technology in their classrooms have the option of simultaneously teaching in-person and online learners or, based on their preferences, needs, or course design, can record their lectures for their online sections while teaching in-person. Therefore, instructors will create course materials and content for both in-person and online access. Although it might appear difficult, the HyFlex approach can aid in overcoming some of the challenges brought on by the uncertainties surrounding our future learning settings.

However, according to Lucas Kohnke & Benjamin Luke Moorhouse (2021), HyFlex is a very new and, until recently, underutilized mode, and little research has examined this modality as a competitive option to face-to-face-only or online-only modes of learning and instruction.

Based on the facts presented and with the need to integrate innovative teaching strategies and pedagogical concepts in dealing with the post – pandemic that the educational system of the country is currently experiencing, it was identified that a full implementation of hyflex learning is needed. Bearing this in mind, the researcher conducted this study to develop and assess a hyflex – ready classroom using ADDIE Instructional Model.

## 1.1 Statement of the Problem

This study generally aimed to develop a hyflex-ready classroom considering the different variables of hyflex learning. Specifically, this study sought to answer the following:

1. How may the composition of Hyflex-ready classroom be analyzed in terms of its course content?
2. How may the design of the Hyflex – ready classroom be described in terms of:
  - 2.1 physical components;
  - 2.2 pedagogical components;
  - 2.3 application standards; and
  - 2.4 design solution?
3. How may the development of the Hyflex – ready classroom be described in terms of:
  - 3.1 content development; and
  - 3.2 procedure development?
4. How may the implementation of the Hyflex – ready classroom be described?
5. How may the validity and assessment of the developed Hyflex – ready classroom be described based on the:
  - 5.1 content and design by content and pedagogical experts; and
  - 5.2 instructional use by teachers and students?

## 2 Methodology

### 2.1 Research Design

This study employed the developmental research design. Developmental research is the systematic study of designing, developing instructional programs, processes, and products that must meet the criteria of internal consistency and effectiveness (Richey, Klein, & Nelson, 2010). This method was the most appropriate to use since this study sought to develop a Hyflex – Ready Classroom. The ADDIE model of instructional development by Pappus, as cited by Forest (2014), was employed in this study. The model of development is shown in Fig. 1. It shows the step-by-step procedure in the development of the HRC.

### 2.2 Participants

The participants of the study were the two (2) experts in the field of Mathematics composing of one (1) Professor, and one (1) SHS Master Teacher. One (1) pedagogical expert also served as a participant of the study. The pedagogical expert was selected considering that the latter has undergone at trainings in hyflex learning and had a great background in curriculum development.

These evaluators examined the content of the HRC whether the parts and content followed the rules on HRC development. These three experts evaluated the design and contents of the HRC.

Ten (10) Mathematics instructors/teachers and twenty (25) BSE Mathematics students of NEUST - College of Education assessed the instructional use of the HRC.

### 2.3 Instrument

This study used instruments which were of great help to obtain data leading to the success of this study. This study used i) Design Solution Evaluation Tool, ii) Content Development Rubric, iii) Observation Protocol for Mathematics Instructors, iv) Questionnaire for Content and Pedagogical Experts, and v) an Interview Guide for Mathematics students.

All instruments undergone a rigid process of validation. After the validation process following the Lynn Framework, all instruments obtained a content validity index of 1.00.

### 2.4 Data Analysis

In this study, the data that were obtained and analyzed using the following statistical treatment:

1. The analysis of the course content through its learning competencies was done through rigid analysis and deliberation of the course outcomes and learning competencies for the course Integral Calculus handed down by the Commission on Higher Education to the NEUST-College of Education in comparison to the learning competencies of Integral Calculus as being offered as one of the major courses of BSE-Mathematics. Also, the time allotment for each course outcome was analyzed and deliberated. The analysis and deliberation were described in a textual manner.
2. The design of the proposed HRC was described in terms of its components divided into the physical components which includes all facilities and equipment to be utilized in the HRC. Another component is the pedagogical components which includes the learning materials, learning activities, and assessment used in the delivery of instruction in a hyflex – ready classroom. In this part of the study, the way of delivery and organization of content in each part were discussed in a textual manner.

The design of the proposed HRC was also described in terms of its application standards that were described in reference to the framework as shown in Table 1.

3. To describe the development of the HRC, the content development and procedure development used for each unit were discussed in textual manner. The contents for each unit were discussed and aligned to the content as prescribed in the syllabus of instruction, CHed memoranda, and Philippine Professional Standards for Teachers. The Content Development Checklist was utilized in describing the content development of the HRC.
4. To describe the implementation of the HRC, the data gathered through the Interview Guide for Mathematics students served as the source of data. Their responses in some parts and interaction during conduct of Hyflex Classes were also considered as a source of data in this phase.
5. In the evaluation stage of the developed HRC, the content, design, and instructional use were assessed. Two Mathematics experts and one pedagogical expert who evaluated the design and content of the HRC.

To describe the assessment of Mathematics Instructors on the developed HRC on the instructional use, qualitative description was used.

**Table 1.** Framework for Application Standards

Policies and Standards	Sections
CHED Memoranda	In compliance to CHEd Memo No. 75, Series of 2017 a. section 6 (Program Outcomes); and b. section 7 (Performance Indicators) In compliance to CHEd Memo No. 6, Series of 2022 c. Transition Framework Plan
Philippine Professional Standards for Teachers (PPST)	In compliance with Philippine Professional Standards for Teachers (PPST) as reflected in the following: a. Domain 1 (Content Knowledge and Pedagogy); b. Domain 2 (Learning Environment); c. Domain 4 (Curriculum and Planning); and d. Domain 5 (Assessment and Reporting)
Hyflex Learning standards	In compliance with: a. Content; and b. Assessment standards.

The learning materials and learning activities were described in terms of clarity of content.

The learning activities was also described in terms of students’ participation.

The Assessment were assessed in terms of clarity of instruction, scoring, and level of measurement of targets.

The time allotment for the execution of each lesson was assessed in terms of adequacy and as reflected in the course syllabus of Instruction.

Moreover, the HRC was assessed by the students describing how they found the use and execution of HRC in their class.

**2.5 Ethical Consideration**

Concerns about ethics were taken into account when conducting this study. In addition to asking their parents’ permission, the involved individuals were asked for their consent to participate in the study. The participating students were requested to provide written consent and information about the study’s goals. In accordance with the Data Privacy Act of 2012, it was made clear that even if they participated, their identities would be kept secret once the replies were processed. The study participants received no rewards for taking part.

### 3 Results and Discussions

The development of the HRC adopted the ADDIE model of instructional development with the following phases: analysis, design, develop, implement and evaluate.

#### 1. ANALYSIS

In the analysis phase, the Course Content of Hyflex – Ready Classroom is being analyzed and crafted following CHED Memorandum No. 75, series of 2017. The units and topics that were considered to be part of the study was based on the crafted syllabi of Philippine National Research Center for Teacher Quality (2020) for the program Bachelor of Secondary Education major in Mathematics. The topics included in this study are seven learning units under the course integral calculus and as follows:

- Unit 1: Integration Concepts and Formulas
- Unit 2: Techniques of Integration
- Unit 3: Definite Integrals
- Unit 4: Applications of Definite Integral
- Unit 5: Indeterminate Forms
- Unit 6: Improper Integrals
- Unit 7: Polar Coordinates

These topics served as the basis for the content of the syllabi of instruction that was implemented in a hyflex – ready classroom.

#### 2. DESIGN PHASE

The design of the Hyflex – Ready Classroom was described in terms of its i) physical components, ii) pedagogical components, iii) compliance to application standards and iv) alignment to set design solution.

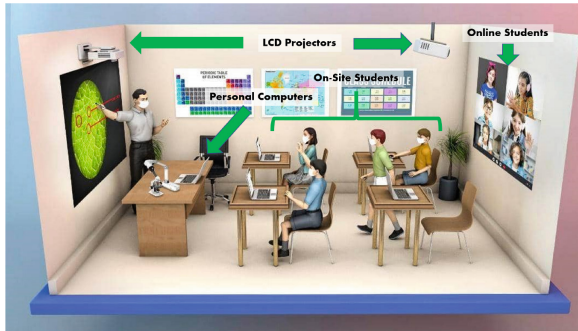
##### 2.1 Physical Components

The physical components of the hyflex – ready classroom as shown in Table 2 was described according to the equipment used, needed quantity, its price and availability. Size of the classroom was also described in this phase of development.

As shown in Table 2, it was identified that there are two equipment/gadget necessary to set – up a hyflex – ready classroom. As shown in Table 2, an HRC needs two LCD projectors to served as projecting tool in showing the slides or zoom whiteboard of the teacher. Another projector was used to project the students in the online platform to

**Table 2.** Physical Components of Hyflex – Ready Classroom

<i>Equipment/ Gadget</i>	<i>Unit Cost</i>	<i>Needed Quantity</i>	<i>Total Cost</i>
LCD Projectors	P18,000	2	P36,000
Teacher's Laptop	P60,000	1	P60,000
<b>Total</b>			<b>P96,000</b>



**Fig. 1.** Set – Up of Physical Components of Hyflex – Ready Classroom

assure that they are seen by their classmates in the on-site set – up. Also, a teacher’s laptop was set to served as the main material of the teacher in discussing and explaining the lessons. This set – up approximately costs P96,000.00 and can be utilized in a 5 m × 5 m lecture or educational technology classroom.

Meanwhile, Fig. 1 shows the proposed design and set – up of a hyflex – ready classroom.

## 2.2 Pedagogical Components

Pedagogical components of this study pertains to the parts of the teaching – learning process adapted for the set – up of Hyflex Learning. This study utilized the parts of lesson plan as defined by Stauffer, B. (2019). The pedagogical components adapted for the purpose of this study includes introduction, lesson objectives, learning materials, lesson procedure or activities, assessment method and lesson reflection. Considering the scenario of a hyflex learning, the researcher had modified the learning materials, lesson procedure or activities, assessment method and lesson reflection to cater the needs of the students complementing their selected or current learning environment. It was assured by the researcher that the modified pedagogical components suits the learning needs of the online students and on-site students.

The following are the pedagogical components that were adapted and to be implemented in a hyflex – ready classroom.

### a. Introduction

The Introduction covers a brief synopsis of the subject matter covered in each unit. It gives the students a chance to think about and get a preview of what they will learn by the conclusion of the unit. The emphasis in the introduction was placed on the topic’s practical application in order to make it more user- and learner-focused and engaging to read.

### b. Lesson Objectives

This component states the desired learning competencies that the students are expected to learn after the teaching and learning process for the specified unit.

### c. Learning Materials

The lesson materials include the learning resources that will be used for the students to acquire the necessary skills and concepts of the topic and unit at hand.

This learning materials were modified in such a way that the online students have the opportunity to learn the lessons even in the comfort of their houses. These materials includes books, modules, recorded videos, and modified pre – assessment activities but not limited to the following.

d. *Lesson Procedure or Activities*

Following the discussion and discussion forum, a formative evaluation called the activity is utilized to gauge how much the participants have learnt. It is a problem-based exercise that evaluated how well the unit’s particular topic was applied. Each task has a good scoring guide supplied. For the purpose of implementing the lessons in a hyflex set – up, activities were modified in such a way that even the students are not physically present, they can still answer the activities with minimal to no chance of cheating and dishonesty.

e. *Assessment Method*

Assessment Method pertains to all summative assessments conducted to further measure the acquired skills and knowledge of the students for a certain topic or unit. The assessment method comes into the form of Unit Test and Performance Task.

A unit test is a 5 to 10 item problem-based test that will be solved by the students. Applications of the discussed topics and unit is necessary to completely and correctly answer these problems. For the purpose of hyflex – learning, both groups, online and on-site group will take the same unit test. The contents of the Unit Test are applicable to both groups of students and there will be shifting of on-site assessment to ensure that all students will have the experienced of face to face assessment.

Another assessment method is through authentic assessment in a form of Performance Based Assessment. In this pedagogical component, the teacher gives a performance task for the students to do and be submitted on or before the set deadline. Both groups will have the same performance task but with modifications considering the nature of their current learning environment for the specific unit that they are currently taking.

f. *Lesson Reflection*

Three questions make up the Lesson Reflection section, which reviews the lessons taught at the conclusion of the unit. The students presented their theories and judgments regarding the unit or topics.

g. *Application Standards*

The lessons implemented at HRC took into account three (3) application standards to make sure they adhered to policies and standards like a) CHED Memoranda as reflected in CHED Memo No. 75, series of 2017, and CHED Memo No. 6, series of 2022, b) Philippine Professional Standards for Teachers (PPST), and c) policies and standards for hyflex learning.

After rigid studies and complementation of these application standards, the researcher was able to revised the design of the learning activities and assessment method to be implemented in an HRC.

## 2.4 *Design Solution*

The HRC’s design solution was outlined in order to ascertain whether or not it complies with the various factors that should be taken into account when creating and



**Table 3.** Design Solution of the HRC

<i>Descriptors</i>	<i>WM</i>	<i>Verbal Interpretation</i>
The design of the learning activities and assessment implemented in the HRC reflects the realization of the objective for which the design is crafted for.	3.00	Completely Satisfied
The components of the design functions to serve the objectives of the design problem	3.00	Completely Satisfied
The design aims to achieve a holistic design that awarely integrates standards	3.00	Completely Satisfied
The design aims to achieve a holistic design that awarely integrates creativity	3.00	Completely Satisfied
The design aims to achieve a holistic design that awarely integrates feasibility	3.00	Completely Satisfied
<b><i>Grand Mean Rating</i></b>	<b><i>3.00</i></b>	<b><i>Completely Satisfied</i></b>

putting into practice a design. The table displayed the evaluation of the design solution (Table 3).

Table 2 summarizes the ratings given to the HRC design solution by the researcher, a mathematics professor, and college pedagogical specialists. Based on the provided amendments, suggestions were taken into account.

An overall value of 3.0, which is translated as very satisfaction, was given to the claim that “The design of the learning activities and assessment applied in the HRC represents the realization of the target for which the design is built for.” The design utilized to deliver the content of the HRC was also praised by the evaluators of the design solution because it is user-friendly and allows the user the chance to understand the lessons/topics using a variety of learning experiences and resources.

Generally, the HRC design solution obtained a grand mean rating of 3.0 with the verbal interpretation of completely satisfied. This implies that all the criteria to be considered in formulating the design of the learning activities and assessment suitable for a hyflex learning are greatly and completely taken into account.

This phase is also anchored to the claim of Rollins, A. (2018). The former discussed that naturally, the first step is to plan and organize your course material. You must analyze and establish your course structure (what chapters or main concepts) in advance for a MOOC, or any other eLearning material and decide what information needs to be presented when and in what context. The latter discussed that designing the content of

the MOOC must consider different standards and policies without sacrificing the quality of the content.

### 3. *Develop Phase*

In this stage, the content and procedure of the HRC were developed.

#### 3.1 *Content Development*

The content of the HRC was anchored in a published book for Integral Calculus. Before using the content of the aforementioned book, the researcher sought permission from the authors of the book.

The researcher sought advice from his peers in the field and the college dean as he developed the HRC. Syllabi of instruction used in the College showed the topics covered by the HRC as well as the amount of time allotted for each. The original draft of the HRC was displayed, and comments regarding the activities and content to be included in an HRC were made using the instructional syllabus as a guide. The first draft of the HRC was revised, and the teachers' recommendations were taken into account. The researcher and the mathematics instructor were shown the second draft of the HRC for their additional comments and ideas. M.A. Alzaghbi (2010) and M.K. Seeletso (2010) that was conducted in a unique way and supports this scenario (2011). According to the former, before they can be employed in actual practice, the development of educational activities is cyclically reviewed. The effectiveness of the initial design could be enhanced using the outcomes of the teachers' simulations. The latter, on the other hand, emphasized that the way in which a piece of content is structured can have a big impact on how well it is understood by learners. The layout should be visually appealing, for instance, the color palette should be appealing, the diagrams should be straightforward and pertinent to the content, and repetition should only be used to highlight important points. As a result, extraneous information must be left out. Manallack and Yuriev (2016) support the actions done throughout the study's progress, to sum up. They believe that the development of instructional materials should be driven by a structure, such as the one used in this research. The Content Development Checklist was used for this purpose. Suggestions were incorporated.

Based on Table 4, the following evaluations on the content of the HRC were drawn:

The statement, "The content of the HRC is designed and presented in a uniform and consistent manner," obtained an overall rating of 3.0 verbally interpreted as completely satisfied. This criterion is shown in the consistent and uniform manner of presenting the content of the HRC in each unit.

A verbal interpretation of "completely satisfied" was given to the statement "Expertise in the content area is evident in the presentation of knowledge," which received a 3.0 overall rating. The researcher's immediate supervisor keeps an eye on how the discussion is presented to make sure it contains accurate, reliable information. The supporting materials, on the other hand, are based on the Integral Calculus module that the researcher and his immediate supervisors wrote. The College has devised a strict validation process for the module.

**Table 4.** Result of the Content Development Checklist

<i>Criteria</i>	<i>WM</i>	<i>Verbal Interpretation</i>
The content of the HRC is designed and presented in a uniform and consistent manner	3.00	Completely Satisfied
Resources are current (less than 10 years) and information is relevant to the learning competencies.	3.00	Completely Satisfied
Information presented in all parts of the HRC are manageable and reasonable for the time allocated.	3.00	Completely Satisfied
More than two (2) credible and relevant learning resources were added to the learning experience.	3.00	Completely Satisfied
More than one learning objective engages the learner in activities, analysis, synthesis, and evaluation.	3.00	Completely Satisfied
Assignments, activities, readings, and/or projects within the course are supplemented to attain the learning competencies.	3.00	Completely Satisfied
The course follows the principles of grammar and sentence structure and is without typing errors.	3.00	Completely Satisfied
Multimedia used throughout the course reflects the progression of course content	3.00	Completely Satisfied
Expertise in the content area is evident in the presentation of knowledge.	3.00	Completely Satisfied
The HRC included at least one (1) activity that will strengthen the interactions with students	3.00	Completely Satisfied
<b><i>Grand Mean Rating</i></b>	<b><i>3.00</i></b>	<b><i>Completely Satisfied</i></b>

The content of this HRC obtained a grand mean rating of 3.0, which is interpreted verbally as completely satisfied. The validity, delivery, and many methods of presenting the topic's substance received excellent praise from the reviewers.

### 3.2. *Procedure Development*

The development of the HRC follows a systematic way of developing a hyflex learning environment. The project started at setting up the classroom which includes the fixing of equipment in such a way that the projection of the slide presentation and online students are visible to all the students. After fixing the equipment, the researcher had created the syllabi of instruction intended for hyflex learning. An intricate evaluation of necessary and most applicable activities was done in order to formulate the most appropriate activities and assessment intended for the attainment of the competencies considering a hyflex learning environment.

After the development and revision of the syllabi of instruction, with the published book as basis for the content of the HRC, the researcher had developed materials, learning activities and assessment method for the purpose of hyflex learning. Two different but aligned sets of materials, learning activities and assessment method were formulated considering the two groups of students engaged in two different learning modalities.

Validation and reliability of materials, learning activities and assessment method were done through the help of experts in the field of Mathematics and teaching pedagogies.

The developed materials, learning activities and assessment method were implemented in the already set-up hyflex – ready classroom.

#### **4. *Implement***

In this stage, third-year BSEd mathematics students from the College of Education, NEUST were assessed using the second draft of the materials, learning activities, and assessment technique in a hyflex-equipped classroom. The participants were taking Integral Calculus at the time. The students who were participating in the implementation were instructed on how the classes would be implemented. Three Calculus Professors/Instructors from the same College and University participated in the class as observers.

The execution of the hyflex classes was successful when seen as a whole. The use of HRC, according to the teacher-observers, was another novelty and teaching approach for Integral Calculus principles and applications. When teaching Integral Calculus, the utilization of several cutting-edge tactics in the form of hyflex learning proved entertaining for the students and increased their level of participation. Due to the success of the earlier phases, the implementation phase of the current study was demonstrated. Here, inferences are drawn about the suitability and viability of the analysis and design phases based on the students' comments and reactions. The definition of Miller, Correnti, and Rowan (B. can be used as evidence for this. Galman and Del Rosario (2021) assert that E. whether the design intent passes the workability test depends on the implementation process. In addition, he argued that promising advancements in teaching and learning can only be predicted if a successful design is followed by a successful execution, at which point the anticipated outcomes can be seen. The teacher's role becomes even more crucial during this time. According to J. Leach (2005), the logic or intent of the instructional content depends critically on teachers' capacity to recognize key design elements. as quoted by Galman and Del Rosario (2021). Extreme caution should be exercised when maintaining or changing such characteristics.

#### **5. *Evaluation***

Based on how well each phase adhered to each standard and stage, it was evaluated. It was demonstrated that the development strictly followed the Gantt Chart during the Analysis phase, took into account the components that were undermined in the Design phase, developed the actual contents based on the Design phase, and took into account the rules outlined in the Implementation phase. Here, qualitative analysis was used to carry out the evaluation phase in each stage. The research done by Galman and Del Rosario supports this (2021). The evaluation phase, according to the former, is essential to design studies because the findings from it serve as a starting point for domain-specific guidelines and a suggestion for potential improvements.

##### **5.1 *Assessment of the Design and Content of the HRC***

Two university-affiliated math specialists and a pedagogy specialist evaluated the HRC. The final HRC draft took into account the findings of their assessment of the

HRC’s structure and content. The evaluation questionnaire’s obtained data were handled using weighted mean.

5.1.1. *Assessment of the Design of the HRC*

Table 5 displays the findings of the evaluation of the HRC’s design by two (2) math specialists and one (1) pedagogy expert.

With a grand mean rating of 2.97, the HRC’s design was deemed to be generally very good. The delivery and design that best suit the delivery of an online course receive high praise from the three reviewers. Another supporting video for the issue should be included, according to one of the reviewers. The method and layout used to communicate the HRC’s material received praise from the evaluators as a whole. Last but not least, the three evaluators praised the appropriateness and alignment of every component with respect to one another and the achievement of the learning competencies.

5.1.2. *Assessment of the Content of the HRC*

Table 6 displays the findings of the evaluation of the HRC’s content by two (2) math specialists and one (1) pedagogy expert.

In general, the content of the HRC was assessed to be Very Good with a grand mean rating of 2.99. The three evaluators highly laud the validity of the content and the

**Table 5.** Summary of evaluation on the design of HRC by mathematics expert and the Pedagogy Expert

<b>Components</b>	<b>WM</b>	<b>Qualitative Rating</b>
The Introduction conveys the idea and content of the lesson/unit	2.95	VG
There is alignment in the Learning Objectives and course outcome	3.00	VG
The learning objectives convey the idea and content of the lesson/unit and direct to the attainment of the course outcome	3.00	VG
The Discussion conveys the idea and content of the lesson/unit and directs to the attainment of the learning competencies.	2.91	VG
The learning materials conveys the idea and content of the lesson/unit and directs to the attainment of the learning competencies.	2.86	VG
The Activity conveys the idea and content of the lesson/unit and directs to the attainment of the learning competencies.	3.00	VG
Formulation of guide questions is concrete and clear and helps the students to lead to the Lesson reflection	3.00	VG
Provisions of Scoring	3.00	VG
<b>Grand Mean Rating</b>	<b>2.97</b>	<b>VG</b>
<b>Qualitative Rating</b>	<b>VG</b>	

**Table 6.** Summary of evaluation on the content of HRC by mathematics expert and the pedagogy expert

<i>Components</i>	<i>WM</i>	<i>Qualitative Rating</i>
The introduction is parallel to the Discussion Proper.	3.00	VG
Statement of the course outcome	3.00	VG
Appropriateness of Learning Objectives	3.00	VG
Discussion	2.95	VG
Learning Materials	3.00	VG
Activity and Scoring	3.00	VG
Lesson Reflection	3.00	VG
<b>Grand Mean Rating</b>	<b>2.99</b>	<b>VG</b>
<i>Qualitative Rating</i>	<b>VG</b>	

inclusion of other supporting materials and activities. One of the evaluators suggested the inclusion of a tutorial video on integrating software applications related to Integral Calculus. As a whole, the evaluators complimented the content and the way of delivering the content of the HRC. One of the experts commended the use and content of each recorded videos that is very suitable to the content of the HRC. Lastly, the three evaluators highly commended that all the parts in each unit are parallel to the contents of the other parts. The learning activities and experiences provided are best suited towards the attainment of the learning competencies.

## 5.2 Assessment of the Instructional Use

### 5.2.1. Assessment of the Instructional Use by the Mathematics Instructors

Ten Mathematics teachers evaluated the content and execution of the seven units of HRC with various topics under the course Integral Calculus. All ten instructors said that the introduction in each unit was clearly specified. They said that all of the information and data presented and including the content of the Introduction attracted and piqued the students' interest. The teachers found the introduction to be enjoyable to read. The inclusion of an application in the Introduction, according to the teachers, helped the learners concentrate their attention on the task correctly, which is an advancement in the HRC.

As to the learning competencies, all ten instructors identified this part in each unit to be clearly stated and follows a specific, measurable, attainable, realistic, and time-bound way of delivering the learning competency. The ten instructors claimed that this part clearly defined the learning content that each student needs or can acquire at the end of each unit.

The discussion was assessed by the ten instructors to be well explained by the teacher in such a way that all information and data were presented clearly. The ten teachers applauded that the sample problems and examples in each unit were clearly delivered

and discussed. One of the instructors commented that the researcher may consider the length of discussion to maintain the interests of the learners. In general, the teachers found the delivery of the discussion to be attracted and piqued the students' interest.

In the activity, nine teachers rated that the activities were well-explained in general and that the information, directions, and data were all presented clearly. Considering the scoring of the activity, the ten teachers commended that the provisions on scoring are all well-explained. Lastly, the teachers assessed the activities to be appropriate to measure the attainment of the learning competencies and topics.

Considering the lesson reflection in the seven units, the ten teachers generally assessed the questions under generalization to be successfully answered by the majority of the students. Also, the ideas presented by the students were correct and minimal elaborations and clarifications were given.

In general, the teachers have assessed the HRC to be applicable in delivering the content of Integral Calculus through the two different learning modalities. The hyflex learning approach offers convenience to the majority of the students since both groups can access the same level and quality of instruction needed for the attainment of the specified competencies. The implementation of HRC will be a great help for the students to have mastery of the course. The teachers also commended that through the use of recorded discussion, the students may go back to the lessons in such cases that they have difficulty in acquiring the knowledge presented in each unit.

#### *5.2.2. Assessment of the Instructional Use by the Mathematics Students*

After the series of interview, the students claimed and highly appreciated the use of HRC in acquiring and learning concepts and mathematical computations in Integral Calculus. The students commented that with the use of HRC, they got the opportunity to learn in the most convenient way without sacrificing the quality of learning. The students claimed that despite the complexity of some topics, they were able to learn and understand Integral Calculus in general with the use of HRC. As to the platform, the students appreciated the flexibility offered by the HRC in learning the topics under study. Lastly, all of the students preferred using HRC in learning Integral Calculus, and they identified it as the best learning modality that suits their interests and resources.

The aforementioned results of the assessment of content, design, and instructional use are supported by a study conducted by Dan Bugler, Stacy Marple, Elizabeth Burr, Min Chen-Gaddini, and Neal Finkelstein (2017). The former researchers stated in their study that instructional materials, in order to be considered valid and applicable to enhance learning, must go through a triangular evaluation of different stakeholders that may utilize the material. In this study, the three stakeholders were the experts, students, and teachers. With the assessment of these three stakeholders, the validity and instructional use of this HRC were greatly realized.

## 4 Conclusions

From the findings of the study, the following conclusions were drawn.

1. The HRC is aligned with the set provisions of CHED and platform used, Facebook social learning group is a feasible and convenient platform to offer massive open online courses.
2. The HRC was designed to attain the objectives through the components and the compliance to the set policies and standards and as reflected in the result of the design solution.
3. The HRC was developed considering a valid and evaluated content and the platform enables students to have a convenient and easier way to access the knowledge provided in this HRC. Also, HRC complies with set criteria for the content development, and the components were aligned towards the achievement of the objectives of the course.
4. The HRC was successfully implemented, and the use of this HRC is a creative and innovative strategy to deliver the content of Integral Calculus.
5. The quality and validity of developed HRC can be established by a defined triangular assessment process by experts, teachers, and students.
6. The development and validation of instructional materials like the Hyflex – Ready Classroom in Integral Calculus is made possible using the ADDIE model.

## 5 Recommendations

In view of the findings of the study, and the conclusions drawn, the following recommendations are offered.

1. Further analysis of different aspects that may contribute to the betterment of the HRC is greatly appreciated and encouraged.
2. The University may consider this study as a reference in formulating a standard format and design for the development of different Courses in a Hyflex learning in the University.
3. Future researchers may consider this study as a reference in developing Hyflex – Ready Classroom considering a valid and evaluated content and procedure of development.
4. Future researchers may look over some external and internal factors that may influence the implementation of this HRC.
5. Further studies be conducted to determine the effect of using the HRC on students' achievement and affective behavior towards Mathematics.
6. Further studies may be conducted considering the effect of using this HRC to students' behaviors and perceptions towards distance or online learning.
7. Further studies be conducted considering other disciplines of Mathematics.
8. The University may consider this study in visualizing and planning the University's future endeavor. Also, the University may consider conducting other similar studies to come up with the idea of Hyflex Engagements.



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