Learning the Basic Skills in Industrial Arts: A Massive Open Online Course for Pre-service TechVoc Educators

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Abstract. With the changing demands brought by the arising technological advances, higher education institutions must take use of advances in communication technology to give their curricula to students who want to continue their studies at any time and from any location. This study focuses on developing a validated Massive Open Online Course for Industrial Arts Part 2, a major subject under the degree Bachelor of Science in Industrial Education and Bachelor of Technology and Livelihood Education. These two programs are Technical Vocational-related programs where graduates are to teach students enrolled in the Technological and Vocational Education Track of the K to 12 program. The primary goal of this development is to create a system for the acquisition of basic skills in Automotive, Civil Technology, Electronics, Electricity, and Metal Works. Using the descriptive-developmental research design, through ADDIE model the study developed the Instructional Material and was evaluated by the Industrial Arts & MOOC experts, Industrial Arts teachers and instructors, and students who served as the participants of the study. The developed MOOC complied with the set criteria for application standards and availability of the platform as reflected in its components. Every component in each unit was a product of a rigid analysis of the course content. Based on the assessment by MOOC and content experts, the design and content of the MOOC obtained an overall assessment of Very Good. The Industrial instructors complimented the use of the MOOC for it offers learning activities that will surely develop a higher degree of learning towards the students. The students, on the other hand, commended the use of supporting videos and a system of delivering the course content since it helps them a lot to acquire the skills needed in their respective degrees. They also claimed that they enjoyed using the MOOC since it comprised of different learning activities with various approaches that elevated and uplifted their learning interests.

Keywords: ADDIE Model · Evaluation · Industrial Arts · Innovation · Massive Open Online Course

1 Introduction

The COVID-19 pandemic has spread across the globe, affecting almost all countries and territories.

The COVID-19 pandemic in the Philippines has had a significant influence on higher education institutions. The consequences are far-reaching, and they have had an impact on learning this academic year and will continue to do so in the coming days. Face-to-face instruction has been phased out at a number of schools, colleges, and universities. Alternative instructional and assessment strategies must be developed and implemented quickly. The COVID-19 epidemic has given us the opportunity to pave the ground for digital learning to be implemented (Dhawan, 2020).

As expressed in the CHED Memorandum No. 04, series of 2020, teaching and learning in the new normal must take the shape of flexible learning. Modified types of online learning are included in these policies to facilitate student learning activities. Asynchronous, delayed-time activities, such as pre-recorded video lectures and time-independent tests, can be used to offer online learning in synchronous, real-time lectures and time-based outcomes assessments (Ali, 2020).

The growing number of students willing to take online courses and programs necessitates the creation of more schools, namely universities, that provide an effective and efficient mode of learning accessible for free online courses available for anyone to enroll that provide an affordable and flexible way to learn new skills, career advancement, and deliver educational experiences at scales such as Massive Open Online Courses or MOOCs.

For the first time, online platforms such as Google Classroom, Zoom, virtual learning environments, social media, and other group forums such as Facebook, Telegram, Messenger, WhatsApp, and WeChat are studied and tried for teaching and learning. These platforms can provide additional resources and guidance to learners in education and refining their abilities in their future careers and professions, even after face-to-face teaching restarts.

While MOOCs have generated a lot of excitement and promise among many stakeholders, the quality of the learning experiences in MOOCs is certainly impressive (Manallack et. al., 2016). The instructional quality of this platform is determined by pedagogical principles for any course in any learning environment and format. Therefore, the purpose of the researcher of this study is to develop an Open Education Resource or OER in the form of Massive Open Online Courses (MOOCs) for the subject Introduction to Industrial Arts Part 2 - common for both BSIE and BTLEd students.

In response to this duty, the researcher aims to develop an Open Education Resource (OER) as required by the Commission on Higher Education. The OER will be in the form of Massive Open Online Courses (MOOC) as a platform in teaching and learning selected topics in the major subjects of both BSIE and BTLEd, specifically in the subject of Introduction to Industrial Arts Part 2 (IEIA/TLEHE 8) that covers basic knowledge and skills in the areas of Automotive, Civil Technology, Electronics, Electricity, and Metal Works.

1.1 Statement of the Problem

The purpose of this study was to develop, validate, and assess a Massive Open Online Course in IEIA/TLEHE 8.

It specifically sought to answer the following questions:

1. How may the analysis of the learning competencies of Industrial Arts be described in terms of their compliance with CHED Memorandum No. 78, series of 2017, and time allocated for lecture and laboratory instruction?
2. How may the design of the proposed MOOC - IA be described in terms of:
    2.1 components; and
    2.2 application standards; and
    2.3 availability and convenience of the platform for the students?
3. How may the development of the MOOC - IA be described in terms of:
    3.1 substantive aspect; and
    3.2 procedural aspect?
4. How may the implementation of the MOOC - IA be described?
5. How may the validity and assessment of the developed MOOC - IA be described based on the:
    5.1 content and design by Industrial Arts and MOOCs experts; and
    5.2 instructional use by Industrial Arts teachers and students?

2 Methodology

2.1 Research Design

This study utilized the developmental research design. The systematic study of designing, creating and reviewing instructional programs, processes, and products that must meet criteria of internal consistency and effectiveness has been described as developmental research, as opposed to simple instructional development. This study aims to develop, validate and assess instructional material for teaching and learning Industrial Arts Part 2 in the form of a Massive Open Online Course. With this given problem, in the mind of the researcher, this research design is the most appropriate to be employed in this study.

In the development of the MOOC - IA, this research utilized the ADDIE model of instructional development of Pappus as cited by Galman & Del Rosario (2021).

2.2 Participants

The participants of the study were two (2) experts in the field of Industrial Arts composing of one (1) Professor, and one (1) Associate Professor. One (1) Professor with experience in the field of MOOC Development also served as a participant of the study. These experts examined the content of the MOOC - IA to validate whether the parts and content followed the rules on MOOC development. These three experts evaluated the design and content of the MOOC - IA.

Ten (10) Industrial Arts instructors/teachers and twenty (20) 2nd Year both BSIE and BTLEd students of NEUST - College of Education assessed the instructional use of the MOOC - IA.

2.3 Instrument

This study utilized instruments that are of great help towards the attainment of the objectives of this research. The validated instruments were adopted with no revisions from existing research conducted by the researcher's colleagues (Alvarez and Galman, 2021) with the approval of the concerned College Dean. This study used i) Observation Protocol for Instructors/Teachers, ii) Questionnaire for Content and MOOC Experts, and iii) Interview Guide for students.

2.4 Procedure of the Study

The researcher conducted this study into two phases, namely: Development and Assessment.

Development Phase. In the development phase of the MOOC - IA, the ADDIE Model was adopted having the following procedures:

Analyze. During the analysis phase, the researcher and the research adviser went through a rigorous analysis of the alignment of learning competencies and the corresponding time allotment of the course as offered by the College of Education in comparison to the learning competencies as mandated by the Commission on Higher Education.

Design. In this stage, the design utilized, in order to attain the objectives of this MOOC – IA, was realized. The design is composed of describing and identifying the components and determining the application standards.

Develop. In this stage, the design as described in the latter phase was used in creating the content and procedure of each learning content as identified in the first two phases.

Implement. In this stage, the developed MOOC - IA was carried out or executed to Industrial Arts classes at College of Education, Nueva Ecija University of Science and Technology.

Evaluate. In this stage, the MOOC - IA was subjected to evaluation.

Assessment Phase. Two (2) Industrial Arts experts and one MOOC developer assessed the design and content of the MOOC - IA. Ten Industrial Arts Instructors and twenty students assessed the instructional use as reflected in the execution of the MOOC - IA.

2.5 Data Analysis

In this study, the data that were obtained in each phase were described and analyzed using the following framework or statistical treatment:

1. The analysis of the learning competencies for the course Introduction to Industrial Arts Part 2 as being offered by the College of Education, NEUST will be rigidly compared to the learning competencies as mandated by the Commission on Higher Education through the CHEd Memorandum No. 78, series of 2017. The time allocation as divided into lecture and laboratory instruction were also analyzed.

2. The design of this MOOC - IA was described as to the components and application standards. The primary components of this MOOC - IA are the following namely: Introduction, Course Outcomes, Learning Competencies, Pre - Assessment, Discussion, Discussion Forum, Laboratory Time and Activity (GRASPS Model), and Generalization. To describe the application standards, the coherence between set standards and the MOOC - IA were discussed. These set standards include i) CHEd Memoranda, ii) Philippine Professional Standards for Teachers and iii) xMOOC standards. In describing the coherence of the MOOC - IA to these standards, the framework below will be utilized.

3. To the development of the MOOC - IA were described in terms of substantive and procedural aspect. These two aspects were discussed in a textual manner.

4. To describe the implementation of the MOOC - IA, the data gathered through the Interview Guide that served as the source of data. Their responses in some parts of the MOOC - IA were also considered as a source of data in this phase.

5. In the evaluation stage, the content, design, and instructional use were assessed. Two Industrial Arts experts and one MOOC expert evaluated the design and content of the MOOC - IA using the scale below (Table 1).

To describe the assessment of Industrial Arts Instructors on the developed MOOC - IA, qualitative description was used on the instructional use.

The Introduction, Course Outcome, Learning Competencies, and Discussion were described in terms of clarity of content.

The Discussion Forum was described in terms of students' participation and students' discussion.

The Pre - Assessment, Activity, Final Output, and Final Examination components were assessed in terms of clarity of instruction, scoring and level of measurement of targets.

In Generalization, these were described in terms of the number of questions answered and explained correctly.

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 MOOC - IA was assessed by the students by describing how they found the use and execution of the MOOC - IA in their class.

2.6 Ethical Consideration

In conducting this research, ethical concerns were taken into consideration. The involved participants' permission was requested in the first section of the online evaluation Google Form, along with information about the study's objectives. It was made clear that even if they participated, their identities would be kept confidential after the responses were analyzed as per Data Privacy Act of 2012. Students and evaluators received a link to the online evaluation for simple distribution. For taking part in the study, the student participants got no incentives.

Table 1. Framework for the Application Standards

Policies and Standards	Sections
CHEd Memoranda	In compliance to CHEd Memorandum No. 78, series of 2017
	a. section 5.3 (Program Goals); and
	b. section 7 (Performance Indicators)
	In compliance to CHEd Memorandum No. 4, series of 2020
	a. section IV (General Guidelines in the Implementation of Flexible Learning); and
	b. section V (Various Modalities in the Implementation of Flexible Learning and Teaching)
Philippine Professional Standards for Teachers (PPST) xMOOC Standards	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
	In compliance with:
	a. Content; and
	b. Assessment standards

Range	Qualitative Rating	Description
2.343.00	Very Good	The MOOC -IA fully meets the criterion standard No modification/revision is recommended
1.672.33	Good	The MOOC IA partially meets the criterion standard. Minor modification/revision is recommended.
1.001.66	Poor	The MOOC IA does not meets the criterion standard. Major modification/revision is recommended.

3   Results and Discussions

A. **Development**

The development of the MOOC – IA follows the ADDIE Model of Instructional Design which is shown in the following phases.

1. *Analysis Phase*

During this stage, the learning competency in the Bachelor of Technology and Livelihood Education and Bachelor of Industrial Education curriculum was examined as prescribed by the Commission on Higher Education (CHED). The time allocated for each topic of the course was also analyzed to determine if the time allocation as mandated by the Commission through CHEd Memorandum No. 78, series of 2017 was greatly complied by the College of Education as reflected in the Course Syllabi for the above course.

The lessons in Industrial Arts Part 2 were classified and performance-based tasks and recorded videos were integrated using a system of delivery to acquire the basic skills in Automotive, Civil Technology, Electronics, Electricity, and Metal Works. Interviews were also conducted among Industrial Arts teachers if they are using MOOC in delivering the content of the course Industrial Arts Part 2. However, the instructors admitted that due to the high degree of technology utilization and complicated system that an MOOC possesses, they find it difficult to create or at least utilize this mode of delivery in presenting lessons of the course. The teachers also admitted that there is no available MOOC for the competencies of Industrial Arts Part 2.

Based on these given facts, the researcher arrived at a decision that there is a need to develop an MOOC to deliver the contents of the course.

2. *Design Phase*

The components, application standards, and the availability and convenience of the platform for the student.

2.1 Components

The components of this MOOC – IA were adopted from the SPARTA Project of Department of Science and Technology. The components that were adopted from the mentioned project and reflected in each learning unit were as follows: Introduction, Course Outcomes, Learning Competencies, Pre – Assessment, Discussion, Discussion Forum, Activity/Laboratory, and Generalization. Moreover, to comply with the University Policy on MOOC development, Final Output and Final Examination were added to serve as final requirements of the participants to be accomplished at the end of five units.

2.2 Application Standards

To ensure that this MOOC–IA will promote quality learning and comply to set standards by different quality assurance and policymakers, this MOOC – IA was developed to comply with set policies and standards as identified by Alvarez & Galman (2021). These policies and standards are a) CHEd Memoranda as reflected in CHEd Memo No.

78, series of 2017, and CHEd Memo No. 4, series of 2020, b) Philippine Professional Standards for Teachers (PPST), and c) policies and standards for xMOOC.

3. *Develop Phase*

In this stage, the contents of the MOOC – IA were written. The template of the MOOC – IA presented in the design phase was followed.

3.1 Substantive and Procedural Aspect

In the course of the development of the MOOC – IA, the researcher consulted Industrial Arts teachers and his adviser. The initial draft of the MOOC – IA was shown to them, and they commented that the presentation of each component of the MOOC – IA was too dull as it was plain as text and needed some illustrative representations of such components. The first draft of the MOOC – IA was revised, and the suggestions of the teachers were incorporated. The MOOC–IA's second draft was again shown to the Industrial Arts teachers and his adviser for comments and further recommendations. The MOOC – IA was also tried out among BSIE and BTLED students of the school-participant to determine the readability of the content and time allocation in the execution of the MOOC -IA. This scenario was supported by the study conducted by Galman and Del Rosario (2021) and the SPARTA Project of Department of Science and Technology. Based on the former, the development of MOOC undergoes cyclic evaluation until it can be used for actual practice. The results of the teachers' enactment could be utilized to improve the original design as it would be more effective for students. The latter, on the other hand, emphasized that the structural design of materials can have a major impact on a learner's comprehension of such materials. The design should be visually attractive; for example, the color scheme should be appealing, images should be clear and relevant to the content, and repetition should be used solely to emphasize key points. As a result, unnecessary elements must be omitted.

4. *Implementation Phase*

In this stage, the second draft of the MOOC-IA was tried among 2nd both BSIE and BTLEd students of College of Education, NEUST who are currently taking Introduction to Industrial Arts Part 2. The students involved in the implementation were oriented on how the implementation of the MOOC-IA would be carried out. A copy of the instructions on how to utilize the MOOC-IA. Three Industrial Arts Instructors/Professors in the same College and University acted as observers during the MOOC-IA implementation.

Unit 1: Basic Knowledge and Skills in Automotive was successfully carried out by the researcher and the class. The introduction of the unit was conveyed by the researcher and clearly understood by the students. The course outcome and learning competency were simply and clearly stated. In the pre-assessment activity, the students clearly understood the procedure of the assessment. However, minimal number of students obtained a perfect score; hence, it can be deduced that there is still room for improvement considering students' knowledge about the topic "Basic Knowledge and Skills in Automotive." In the discussion proper, the topic was well discussed, and examples were given to further clarify the concepts under the topic. In the activity, the instruction was easily followed by the students. While performing the activity, it was observed that the students interestingly participated in the activity. The instructors-observers commend the provisions in the

scoring of the activity. In generalization, the guide questions were answered correctly. In general, the teacher-observers gave no suggestions in delivering the basic concepts and skills in Automotive.

Unit 2: The researcher and the class successfully completed Basic Knowledge and Skills in Civil Technology. The researcher presented the unit's introduction, which was well appreciated by the students. The learning skill and course result were presented simply and clearly. The students thoroughly grasped the evaluation procedure throughout the pre-assessment activities. Yet, more than 50% of students received an almost perfect score, implying that they have enough knowledge regarding the topic, but there is still space for development in terms of students' knowledge of the topic "Basic Knowledge and Skills in Civil Technology." The topic was well-discussed in the discussion proper and examples were presented to further elucidate the concepts under discussion. The students were able to readily follow the instructions in the activity. During the activity, it was seen that the students took an enthusiastic interest in the activity. The provisions in the scoring of the activity are commended by the instructors-observers. In generalization, the guidance questions were accurately answered. In general, the instructor-observers had no recommendations for how to present the fundamental concepts and skills in Civil Technology.

Unit 3: Basic Knowledge and Skills in Electronics was successfully completed by the researcher and the class. The introduction of the unit was delivered by the researcher, which was well appreciated by the students. The learning skill and course outcome were provided in an easy-to-understand manner. Throughout the pre-assessment exercises, the students had a firm grip on the evaluation technique. However, a considerable majority of students obtained an almost perfect score, indicating that they have sufficient knowledge of the issue and that there is still room for improvement in terms of students' mastery of "Basic Knowledge and Skills in Electronics." In the discussion proper, the topic was thoroughly examined, and examples were provided to further clarify the concepts under discussion. The students had no trouble following the activity's directions. During the activity, it was clear that the students were quite interested about it as reflected to their excellent performance. However, according to some students, it is better if they experience a real-life performance task related to the topic than merely cracking a code. With that, in the mind of the proponent, that is the most suitable activity for the students due to their lack or unavailability of materials to experience a real-life performance. The instructors-observers applaud the provisions in the scoring of the exercise. In generalization, the guide questions were answered correctly. The instructor-observers had no more suggestions on the presentation of the basic knowledge and skills in Electronics in general.

Unit 4: The researcher and the students successfully completed the Basic Knowledge and Skills in Electricity. The researcher gave an excellent introduction to the unit, which the students appreciated. The learning skill and course outcome were presented in a simple and straightforward manner. The students had a good grasp of the evaluation technique throughout the pre-assessment exercises. However, few numbers of students had a passing score, showing that they have sufficient knowledge of the subject, but most students' mastery of "Basic Knowledge and Skills in Electricity" can still be improved. The topic was thoroughly studied throughout the discussion, and examples were provided

to further clarify the topics under discussion. The students were able to follow the activity's instructions with ease. The students' enthusiasm for the exercise was evident during the activity, as seen by their exceptional performance. Nonetheless, some students believe it would be preferable if the instructor could incorporate additional supporting videos to enhance the discussion of the topic. The provisions in the scoring of the exercise are praised by the instructors-observers. In generalization, the guide questions were accurately answered. The instructor-observers couldn't think of any more ways to present the basic knowledge and skills in electricity in general.

Unit 5: The researcher and students finished the Basic Knowledge and Skills in Metal Works with flying colors. The researcher provided an outstanding introduction to the unit, which the students found to be very helpful. The learning skill and the course outcome were provided in a basic and uncomplicated manner. Throughout the pre-assessment exercises, the students demonstrated a solid understanding of the evaluation technique. However, the vast majority of students had near-perfect scores, indicating that they have adequate knowledge of the subject and that their mastery of "Basic Knowledge and Skills in Metal Works" can still be enhanced. Throughout the discussion, the topic was thoroughly examined, and examples were offered to further understand the issues at hand. The students had no trouble following the activity's directions. The students' desire for the activity was palpable throughout the session, as seen by their outstanding performance. The instructors-observers applaud the provisions in the scoring of the activity. In generalization, the guide questions were answered correctly.

The MOOC-IA was successfully completed when seen as a whole. The adoption of MOOC-IA, according to the teacher-observers, was another novelty and method in teaching principles and applications in Industrial Arts Part 2. The implementation of several creative tactics in the form of MOOCs in teaching Industrial Arts Part 2 proved to be engaging for students and increased their maximum involvement. The implementation phase was demonstrated in this study as a result of the previous stages' success. The conclusions drawn from the students' replies and reactions indicate the appropriateness and viability of the analysis and design phases. The MOOC-IA was successfully completed when seen as a whole. The adoption of MOOC-IA, according to the teacher-observers, was another novelty and method in teaching principles and applications in Industrial Arts Part 2. The implementation of several creative tactics in the form of MOOCs in teaching Industrial Arts Part 2 proved to be engaging for students and increased their maximum involvement. The implementation phase was demonstrated in this study as a result of the previous stages' success. The conclusions drawn from the students' replies and reactions indicate the appropriateness and viability of the analysis and design phases, as cited by Galman and Del Rosario (2021). Such features should be retained or modified with extreme caution.

5. *Evaluation Phase*

Each phase was assessed based on how well it adhered to each standard and stage. It was demonstrated that during the Analysis phase, the development strictly followed the Gantt Chart; in the Design phase, the parts undermined were considered; in the Development phase, the actual contents were developed based on the design; and in

the Implementation phase, the guidelines were considered. The evaluation step was conducted using qualitative analysis in each phase. The findings of Galman and Del Rosario's studies (2021) support this. The former considers the assessment phase to be critical in design studies since the results reveal areas for improvement and provide a foundation for domain-specific standards. The latter proposes applying qualitative analysis to improve comprehension of the effectiveness of the design under consideration.

5.1. Assessment of the Design of the MOOC - IA

Table 2 shows the result of the assessment of two (2) Industrial Arts experts and one (1) MOOC expert considering the design of the MOOC-IA. The Unit 1, with the topic of Basic Knowledge and Skills in Automotive, had a mean rating of 3.0 (Very Good) considering the design of the MOOC - IA. There are no further suggestions to modify and revise any part of the aforementioned unit of the MOOC - IA. The experts commended the use of a systematic delivery of learning content.

The Unit 2, with the topic of Basic Knowledge and Skills in Civil Technology, had a mean rating of 3.0 (Very Good) with the design of the MOOC – IA as focus. There are no further suggestions to modify and revise any part of the aforementioned unit of the MOOC - IA. The experts identified the well-structured instruction in the activity/laboratory component since it helps the students to easily perform the task without any hesitance and confusions.

Meanwhile, the topic of Basic Knowledge and Skills in Electronics under Unit 3, had a mean rating of 2.934 (Very Good) with the design of the MOOC – IA as focus. One of the experts commented that the output might be revised by incorporating and including a more realistic and life-relevant performance task aside from a mere cracking of numbers. The experts also acknowledged the unavailability of necessary tools and materials needed for performance-based tasks.

For Unit 4, Basic Knowledge and Skills in Electricity had a mean rating of 2.934 (Very Good) considering the design of the MOOC – IA. The experts commended the use of demonstration as a performance-based assessment in the activity component. However, one of the experts suggested that the proponent may include supporting videos to cater to some questions of the students regarding the direction of the task.

For Unit 5, Basic Knowledge and Skills in Metal Works had a mean rating of 2.934 (Very Good) considering the design of the MOOC – IA. One of the experts commented that instead of using research-based activity, the proponent might use real-life performance-based tasks in order to assess the skills of the students.

To sum it up, based on the assessment of the identified experts, the design of the MOOC – IA obtained a grand mean rating of 2.967 verbally interpreted as Very Good. The creativity and the mode of delivering the content of the course were highly commended by the experts. One of the evaluators even said that the design used in constructing this MOOC – IA must be used as the basis for the University's future MOOCs. Lastly, the evaluators highly praised the alignment of the design to the course outcomes and learning competencies.

5.2. Assessment of the Design of the MOOC – IA

Table 3 shows the result of the assessment of two (2) Industrial Arts experts and one (1) MOOC expert considering the content of the MOOC-IA. Unit 1 was given a mean

Table 2. Summary of evaluation on the design of MOOC - IA by Industrial Arts and MOOC experts

Components	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	WM	Qualitative Rating
1. The Introduction conveys the idea and content of the lesson /unit	3.00	3.00	3.00	2.67	3.00	2.934	VG
2. There is alignment in the Learning Competencies and course outcome	3.00	3.00	3.00	3.00	3.00	3	VG
3. The learning competencies convey the idea and content of the lesson /unit and direct to the attainment of the course outcome	3.00	3.00	3.00	3.00	3.00	3	VG
4. The Discussion conveys the idea and content of the lesson /unit and directs to the attainment of the learning competencies.	3.00	3.00	3.00	3.00	2.67	2.934	VG
5. The Discussion Forum conveys the idea and content of the lesson /unit and directs to the attainment of the learning competencies.	3.00	3.00	2.67	3.00	3.00	2.934	VG
6. The Activity conveys the idea and content of the lesson /unit and directs to the attainment of the learning competencies.	3.00	3.00	3.00	3.00	2.67	2.934	VG
7. Formulation of guide questions is concrete and clear and helps the students to lead to the Generalization	3.00	3.00	3.00	3.00	3.00	3	VG
8. The output conveys the competencies in each lesson /unit and directs to the attainment of the learning competencies	3.00	3.00	2.67	3.00	3.00	2.934	VG

(*continued*)

Table 2. (*continued*)

Components	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	WM	Qualitative Rating
9. The final examination is based on the competencies in each unit /lesson and directs to the attainment of the learning competencies	3.00	3.00	3.00	3.00	3.00	3	VG
Provisions of Scoring	3.00	3.00	3.00	3.00	3.00	3	VG
Grand Mean Rating	**3**	**3**	**2.934**	**2.967**	**2.934**	**2.967**	**VG**
Qualitative Rating	**VG**	**VG**	**VG**	**VG**	**VG**	**VG**	

Table 3. Summary of evaluation on the content of MOOC - IA by Industrial Arts and MOOC experts

Components	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	WM	Qualitative Rating
The introduction is parallel to the Discussion Proper.	3.00	3.00	3.00	3.00	3.00	3.00	VG
Statement of the course outcome	3.00	3.00	3.00	3.00	3.00	3.00	VG
Appropriateness of Learning Competencies	3.00	3.00	3.00	3.00	3.00	3.00	VG
Discussion	3.00	3.00	3.00	3.00	3.00	3.00	VG
Discussion Forum	3.00	3.00	2.67	3.00	3.00	2.93	VG
Activity and Scoring	3.00	3.00	3.00	3.00	3.00	3.00	VG
Generalization	3.00	3.00	3.00	3.00	3.00	3.00	VG
Final Output and Scoring	3.00	3.00	3.00	3.00	3.00	3.00	VG
Final Exam and Scoring	3.00	3.00	3.00	3.00	3.00	3.00	VG
Grand Mean Rating	**3.00**	**3.00**	**2.96**	**3.00**	**3.00**	**2.99**	**VG**
Qualitative Rating	**VG**	**VG**	**VG**	**VG**	**VG**	**VG**	

rating of 3.0 (Very Good) when it regards to content by the three evaluators in Basic Knowledge and Skills in Automotive. They did not suggest modifying or revising the specific unit of the MOOC-IA.

Unit 2 was also given a mean rating of 3.0 (Very Good) when it regards to content by the three evaluators in Basic Knowledge and Skills in Civil Technology. No revisions and suggestions were given in this unit of the MOOC-IA.

Unit 3 was given a mean rating of 2.96 (Very Good) when it regards to content by the three evaluators in Basic Knowledge and Skills in Electronics. One of the experts commented that the proponent might revise the discussion forum to cater a more idea–provoking questions.

Unit 4 was given a mean rating of 3.00 (Very Good) when it regards to content by the three evaluators in Basic Knowledge and Skills in Electricity. One of the experts commended the mastery of the instructor in delivering the content of the unit.

Unit 5 was given a mean rating of 3.00 (Very Good) considering the content by the three evaluators in Basic Knowledge and Skills in Metal Works. One of the experts commended the clear explanation and procedures as being discussed in the recorded video.

To sum it up, based on the assessment of the identified experts, the content of the MOOC – IA obtained a grand mean rating of 2.99 verbally interpreted as Very Good. The mastery of the content of the proponent, including his pedagogies in delivering the content and skills, were highly commended by the experts. One of the evaluators even said that the proponent is well-equipped with the knowledge, skills, and pedagogies needed for the subject.

5.3. Assessment of the Instructional Use

This part discusses Instructional Use as assessed by the Industrial Arts Instructors and Students.

5.3.1. Assessment of the Instructional Use by the Industrial Arts Instructors

Ten Industrial teachers/instructors assessed the instructional use of the MOOC IA as to the content and execution of the five units with various topics under the course Introduction to Industrial Arts Part 2. Each unit's introduction was properly described, according to all ten instructors. They claimed that all of the facts and information offered, including the content of the Introduction, sparked the students' curiosity. The introduction was entertaining to read for the students. According to the teachers, including an application in the Introduction helped the students focus their attention on the assignment correctly, which is a step forward in the MOOC-IA.

Considering the course outcomes, all ten instructors said that this component in each unit was clearly stated in an observable manner that can be assessed. They said that the delivery of the course outcomes greatly reflects the topic and the course itself.

Considering the learning competencies, all ten instructors commended the delivery of the learning competencies since it is specific and attainable. The assessment procedures needed to evaluate the competency were also reflective to the learning competencies.

As to the Pre – Assessment, all ten instructors commended the use of already embedded assessment system in the platform since it is easy to be accessed by the participants of the MOOC. The instructions in each pre-assessment in every unit were very clear to students. One of the teachers commented that the researcher might include images and pictures in the pre-assessment.

Considering the Discussion component of the MOOC – IA, ten teachers commended the ability of the proponent of the study to convey the topics and to deliver the content of the course using interactive video discussion. The discussion forum, on the other hand, as commented by the teachers, was a great tool for the attainment of the learning competencies in each unit since it encourages students' participation and lets the students think and compose ideas about what they have learned in the Unit.

When it regards to the activity or laboratory activity provided in each unit, the ten instructors commented that the inclusion of both performance-based and traditional assessments paved way to a better assessment procedure for the students. One of teachers commented that the researcher might include examination–like assessments that may be accessible through another online platform.

Considering the generalization, ten teachers commended the use of both lower order thinking skills (LOTS) and higher order thinking skills (HOTS) questions in assessing and summing up the learned competencies by the students.

As to the final output and final examination included in the MOOC – IA, the teachers commended on the use of performance-based assessment in the final output. However, they commented that a more real-life like situation and task must be provided for the students.

5.3.2. Assessment of the Instructional Use by the Industrial Arts Students

The students' evaluations of the MOOC-IA's five units were based on their experience practicing and utilizing the MOOC-IA, as well as their thoughts and feelings about the MOOC's instructional usage.

In Unit 1: Basic Knowledge and Skills in Automotive, nineteen students who were randomly interviewed said they enjoyed learning the concepts and skills regarding basic knowledge and skills in Automotive, specifically the automobile electrical system and major parts of an automobile, through the MOOC-IA. Regardless of the topic's or unit's complexity, all of the students reported that the well-discussed and well-presented discourse as seen in the video and other learning aids and exercises helped them learn and understand the lesson. The students initially had no prior knowledge of the topic, but they claimed that by using and utilizing the MOOC-IA, they were able to grasp the content of the lesson. One of the students stated that she had to view the video multiple times in order to grasp the task. Students have observed no technical or operational challenges in using Facebook social learning groups as a learning medium. Finally, the students answered that they prefer MOOC-IA to modular learning for learning basic information and abilities in Automotive. The usage of learning videos and supporting resources was regarded as a critical aspect in better understanding the teachings in each unit.

Twenty students who were randomly interviewed in Unit 2: Basic Knowledge and Skills in Civil Technology said they enjoyed learning the concepts and skills related to basic knowledge and skills in Civil Technology, particularly the discussion on parts of the house and civil technology materials, through the MOOC-IA. Regardless of the topic's or unit's complexity, all of the students said that the well-discussed and well-presented discourse featured in the video, as well as other learning aids and exercises, assisted them in learning and understanding the lesson. The students said that through using and utilizing the MOOC-IA, they were able to absorb the content of the class despite

having no prior knowledge of the issue. One of the students said she had to watch the video several times in order to understand the task. Students have reported that using Facebook social learning groups as a learning medium has presented no technical or operational issues. Finally, when it comes to learning basic facts and competencies in Civil Technology, the students prefer MOOC-IA to modular learning. The use of learning videos and related resources was deemed crucial to better understanding the teachings in each unit.

Furthermore, eighteen out of twenty students who were randomly interviewed said they liked and enjoyed studying the concepts and skills in the third unit with the Basic Knowledge and Skills in Electronics after utilizing the MOOC-IA. Students also said that, despite the difficulty and complexity of the themes and unit, the instructor was able to communicate the content in a well-defined manner, and that the topic was well-discussed in the video, with concrete examples. The students admitted that the complexity of the themes made it difficult for them to grasp the unit's material, even after seeing the video numerous times. They were able to acquire suggestions from their classmates by including other learning resources and discussion forums. They were able to grasp the lesson more easily after using these. The students claimed that the intricacy of the lesson, rather than the delivery of the subject, was the cause of their difficulties in learning it. In fact, they claim that the MOOC-method IA's of delivering content provided them with a more relevant and better way to acquire, learn, and understand the concepts and skills electronics embedded in the lesson. Meanwhile, when it came to the platform, all students agreed that using the Facebook social learning group was the easiest and most open option for them. Finally, while deciding between modular and MOOC-IA in this unit, students have reported that they prefer MOOC-IA since it offered them with a variety of learning activities and interactions that substantially enhanced their grasp of the course.

In Unit 4: Basic Knowledge and Skills in Electricity, eighteen students who were randomly interviewed said they enjoyed learning the concepts and skills regarding basic knowledge and skills in Electricity, specifically the application of Ohm's Law and electrical tools and equipment, through the MOOC-IA. Regardless of the topic's or unit's complexity, most students reported that the well-discussed and well-presented discourse as seen in the video and other learning aids and exercises assisted them in learning and understanding the lesson. However, a few students believe it would be preferable if the instructor could incorporate additional supporting videos to enhance the topic's discussion. The students said that through using and utilizing the MOOC-IA, they were able to grasp the content of the class despite having no prior knowledge of the issue. Two of the students said they had to watch the video several times to understand the topic. Finally, the students answered that they prefer MOOC-IA to modular learning for learning basic information and abilities in Electricity. The usage of learning videos and supporting resources was regarded as a critical aspect in better understanding the teachings in each unit.

In Unit 5: Basic Knowledge and Skills in Metal Works, seventeen students who were randomly interviewed said they enjoyed learning the concepts and skills regarding basic knowledge and skills in Metal Works, specifically the types of welding equipment and tools, and the application of types of welding processes, through the MOOC-IA.

Regardless of the topic's or unit's complexity, most students said that the well-discussed and well-presented discourse featured in the video, as well as other learning aids and exercises, assisted them in learning and understanding the lesson. The students said that through using and utilizing the MOOC-IA, they were able to absorb the content of the class despite having no prior knowledge of the issue. Three of the students said they had to watch the video several times to understand the topic. Students have reported that using Facebook social learning groups as a learning medium has presented no technical or operational issues. Finally, when it comes to learning basic concepts and skills in Metal Works, students prefer MOOC-IA over modular learning. The use of learning videos and other supporting resources was deemed critical to better understanding the teachings in each unit.

A study undertaken by backs up the findings of the content, design, and instructional use assessment. In their study, the former researchers noted that instructional materials must go through a triangle review of diverse stakeholders who may use the content in order to be regarded legitimate and appropriate to promote learning. The specialists, students, and teachers were the three stakeholders in this study. The validity and instructional usage of this MOOC-IA were considerably enhanced by the assessment of these three stakeholders.

4   Conclusions

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

1. The MOOC – IA is aligned to the CHED Memorandum No. 78, series of 2017 considering the competencies, used platform, and time allocation.
2. The MOOC – IA is designed complementing the provisions set in the identified standards and policies as stated in different CHED Memoranda and Application standards and as reflected in the components of the developed MOOC.
3. Content and Procedural development were considered in the development of this MOOC – IA.
4. This MOOC – IA was successfully implemented to the BSIE and BTLEd students in innovative and systematic way.
5. The quality and validity of produced MOOC-IA can be determined using a standardized triangular assessment process including experts, teachers, and students.
6. The ADDIE model permits the development and validation of educational materials like the Massive Open Online Course in IEIA/TLEHE 8.

Recommendations
Based on the findings and conclusion presented, the following recommendations are suggested:

1. Further analysis of different aspects of the MOO – IA is highly encouraged for the betterment of the MOOC.
2. The University may use this study as a guide in formulating a massive open online course that may use and implement by the different colleges.

3. Future researchers may use this study as reference in developing quality, and valid massive open online courses.
4. Future researchers may look over some internal and external factors that may affect the implementation of this MOOC – IA.
5. Future studies may be conducted to determine the effectiveness of this MOOC – IA in students' knowledge and skills acquisition.
6. Future researchers may consider the effect of using MOOC – IA to different affective factors of students.
7. The University may consider this study in its goal to produce open online courses and to formally began the endeavor to offer Open University.

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