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Research Article

Effectiveness of a Massive Open Online Course as an Instructional Material in Economics Using the ASSURE Model

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ABSTRACT

Econexus is an additional learning management system (LMS) which is described and tested in this paper as an implementation of a massive open online course (MOOC) for Grade 9 Economics. The research used a quantitative developmental approach and a quasi-experimental pretest–posttest design and involved a total of 39 students in one private secondary school in the Philippines. A baseline assessment of 60 items was administered to 27 participants who were not achieving 70% of the items and placed them in the intervention track (Econexus and regular lessons), while 12 participants who did achieve 70% of the items continued only in regular lessons. During the 30-day intervention, the intervention group read a series of five Term 1 units, watched a series of instructional video clips, took a series of formative (in the first week of Term 1) quizzes, discussed the forum, and reflected on the self-reflection questions. Assessment data was gathered from the official curriculum documents, performance assessments, a survey using a 4-point scale to access user experience and platform logs. The students who did receive the supplementary online materials had a large and significant increase in scores from M = 25.52 to M = 42.37 out of 60, $t(26) = -9.456$, $p < .001$. However, when directly compared, there was no statistical differences between the $t(37) = -0.588$, $p = .560$, or between the movement of scores $t(11) = -0.163$, $p = .874$, for the control group. Content (M = 3.70), system usability (M = 3.70) and site accessibility (M = 3.71) were rated as very good throughout the survey. The previous curriculum audit directly influenced the structure and features of content.The structure and features of content directly related to the previous curriculum audit. Finally, although the students' response to Econexus was quite positive and the students who were struggling to make academic progress did make significant progress, the gains cannot be attributed solely to

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the use of the digital platform due to the nonrandom grouping of participants and initial differences in baseline proficiency.

***Keywords**: Academic Achievement, Blended Learning, Digital Instruction, Learner Satisfaction, Self-Regulated Learning*

Introduction

Grade 9 Araling Panlipunan presents scarcity, choice, production, consumption and market processes. Pupils may have learning challenges in grasping and implementing these concepts in their decisions when they may not have opportunities to practice and receive feedback on their decisions. The following concerns have been identified in the Philippines for Economics: Economics proficiency, curriculum content, teaching materials and assessment (Cabauatan & Dacles, 2021; Gauuan, 2023; Quirao et al., 2023). The concerns warrant a consideration of supplementary materials with a curricular focus that match closely the prescribed competencies, as opposed to the addition of digital materials where there is no clear curricular goal.

The use of online resources can help to provide explanations, evaluation, and support activities outside of the classroom as per scheduled class time (Joshi & Koirala, 2023; Msafiri et al., 2023). However, the availability of an LMS / MOOC does not guarantee learning. The structure of the courses, teacher support, meaningful involvement, and the ability to control one's learning are still important (Al-Shabandar et al., 2018; Panadero, 2017; Tang et al., 2024). Similar results suggest that mentoring and learning support within the school are important in the implementation of secondary school MOOCs in Hong Kong (Tang et al., 2024). These findings are applicable to the Southeast Asian context, but differences in the participants, subjects and implementation make it inappropriate to draw direct conclusions regarding the effectiveness of the findings in the context of an Economics class in the Philippines.

Econexus: Grade 9 Economics Learning Hub is an additional online MOOC (Massive Open Online Course) created for the five Arling Panlipunan competencies that are covered in Term 1 of the Grade 9 Curriculum: Introduction to Economics and sustainable development, scarcity and economic systems, production and entrepreneurship, consumption and consumer rights, and demand and supply. The overall development framework was provided by ADDIE and ASSURE guided planning and implementation of instruction and Merrill's First Principles guided learning activities. The resulting platform included short lessons, readings, formative checks, application tasks, discussions and reflections. It was meant to supplement instruction in the classroom and to offer extra explanations, guided practice and opportunities for the application of concepts which were specifically identified in the learning competencies of Grade 9.

The study analyzed (a) the documentary curricular and instructional basis of Econexus, (b) application of the six ASSURE stages, (c) scores of changes in knowledge, application and interpretation, (d) compare within-group and between-group achievement and (e) the satisfaction of intervention learners regarding content, usability, and accessibility. This assessment was designed to report the implementation and outcomes observed without assuming a nonrandom comparison to be definitive evidence of a platform effect.

Methodology

Design and Research Setting

This study used a quantitative developmental methodology combined with a quasi-experimental pretest–posttest design with an intervention subgroup of cutoffs. The sample consisted of a single intact Araling Panlipunan class in a private secondary school in Nueva Ecija, Philippines which has 39 Grade 9 students who provided their informed consent for

academic year 2026-2027. The selection of the participants was done on purposive sampling. This study used no placement or baseline equivalence matching.

Grouping Intervention

All learners completed a 60-item pretest. Using the prespecified criterion of 70% (42 of 60 points), 27 learners scoring below the threshold were designated the intervention subgroup; the remaining 12 constituted the conventional group. Both groups received regular Economics instruction. Only the intervention subgroup received additional access to Econexus during the 30-day implementation. Its five modules addressed introductory Economics and sustainable development, scarcity and economic systems, production and entrepreneurship, consumption and consumer rights, and demand and supply. Learning activities included readings, short video lessons, quizzes, discussion prompts, reflections, and applications accessible through internet-enabled devices.

Development and Documentary Analysis

The design of the platforms followed the Grade 9 Araling Panlipunan national curriculum guide, school's Term 1 syllabus map, 2026 three-term Budget of Work schedule, as well as the structural requirements of five core units. The creation of synthesis of 13 major document items resulted in five guidelines of the subject matter and eight instructional parameters. Unigram and bigram term frequency–inverse document frequency (TF-IDF) models were used to extract features and exploratory K-means clustering was used to perform a clustering. The values of within-cluster sum of squares (WCSS) were computed for different possible divisions into clusters and a preliminary three-cluster division was indicated for each of the feature sets using a maximum distance geometric approach. These cluster groupings were only used descriptively as structural tools and not as identified dimensions or markers of pedagogical gaps as would be expected with larger corpora and identifiable elbow points in the data. Technical specifications were created from the synthesized document insights before launch of the platform. The sequence and scope of the five learning modules were determined by the subject-matter items; while the instructional guidelines determined how the learning goals, real world tasks, digital media, evaluations, interactive forums, reflection tasks and flexible entry to the system were integrated. Learner profiling, setting objectives, choosing media, engaging students and evaluating and refining overall processes were documented in an ASSURE evidence matrix.

Instruments and Quality Procedures

The researcher developed a 60-item multiple-choice pretest and posttest that was divided into knowledge (30 items), application (15 items), and interpretation (15 items) items. Each of the correct answers was awarded one mark and the total maximum mark was 60. In addition, the intervention subgroup was asked to complete a 30 item evaluation scale on the content of the platforms, the usability of the platform interface and the accessibility of the platforms on a 4 point rating scale (1 = Strongly Disagree; 4 = Strongly Agree). The courseware and testing tools were judged by six content specialists (two in Economics, two digital platform developers, two educational design specialists) on content validity, clarity and grade-level appropriateness. Twenty non-sample students were initially tested to inform revisions to the items and polishing the survey.

Pilot Testing and Instrument Reliability

The 60-item Economics evaluation tool was used and administered to an independent sample of 20 learners not included in the final research sample and was pilot-tested for this purpose. Internal consistency was measured using the Kuder–Richardson Formula 20 (KR-20) which is appropriate for dichotomous test items. The internal consistency of the initial baseline testing was good with a reliability score of 0.914. The post-intervention pilot administration, on the other hand, had a coefficient of 0.236, indicating decreased

consistency across administrations. The results show differences between the stability of scores from test administration to test administration. The results of overall performance were analyzed with analytical conservatism due to the small number of participants in the pilot and the low reliability ratio for the post-test.

Data Collection and Analysis

Prior to data collection, parents/guardians gave their consent and students gave their assent, and schools gave their approval. The pretest was followed by the instructional activities and then the posttest was given to learners. The satisfaction questionnaire was only given to the intervention subgroup. Additional evidence of implementation was provided through a school-issued Certificate of Utilization and screenshots of the platforms. Means (M), standard deviations (SD), and mean percentage scores (MPS) were used to summarize the scores. The pretest–posttest differences for each group were analyzed using paired-samples t tests, and between groups using an independent-samples t test. A value of $\alpha = .05$ was used to determine statistical significance. Respondents' satisfaction was summarized by dimension. No new calculations of inferential estimates based on Participant-level data were performed for this revision, instead the estimates that were reported in the study's statistical output were adopted.

Interpretive Limitations

Allocation related directly to baseline achievement resulting in nonequivalent groups. In fact, the expected change in scores (the regression to the mean), as well as the impact of unmeasured differences in time on task, may contribute to the observed changes in scores. There was no baseline adjustment for the post test between group tests. The study took place in one school and involved a small number of students and was not systematically measured longitudinally for engagement, completion and retention.

Results and Discussion

Documentary Basis for Curriculum Design

There were five curricular considerations corresponding to the five topics of the modules: (1) introduction to Economics and sustainable development; (2) scarcity, allocation and economic systems; (3) production and entrepreneurship; (4) consumption and informed consumer behavior; and (5) demand and supply. The eight instructional considerations included aimed at alignment of objectives and sequences of lessons, contextualized tasks, formative assessment/summative assessment, multimedia explanations, learner participation, reflection, and access. These statements helped to facilitate the subject matter and the functions in which learners came across it on the platform.

The values of WCSS decrease with the increasing number of candidates in the number of clusters, as shown in figure 1. The WCSS line for both curricular and instructional plots is not significant enough to have a distinct and clear elbow. The number of stable categories in the graph does not show that $k = 3$ is a practical value to use for exploratory partition; this is determined by the geometric maximum distance. This difference is especially significant when there are just five curricular statements and eight instructional statements – increasing k inevitably affects WCSS, and individual statements have significant impact on the resulting partition. Thus, this analysis was used to guide planning decisions, rather than to identify learning gaps or to confirm curricular constructs.

The document analysis provided deployment information in two complementary ways, operationally. First, topics of the curriculum decided on what was taught, the sequence of curriculum modules and the achievement items that were covered. Second, the instructional considerations guided learner engagement with the content, exposing them to concise explanatory materials for concept introduction, opportunities for practice through Quick Checks and quizzes, opportunities for applying economic ideas to familiar tasks through

applied tasks, and opportunities for participation and self-monitoring through discussions and reflections. This process resulted in a design that ensured that the online supplement was linked to the competencies in Term 1 and not the functions of an LMS. This context sensitive approach aligns with evidence that digital tools should be used for specific learning purposes, and for teacher-led learning (UNESCO, 2023; Msafiri et al., 2023).

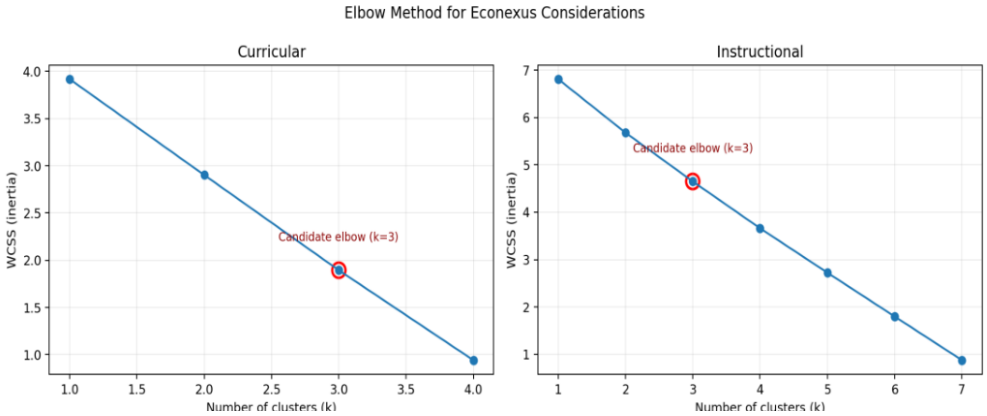

Figure 1. Elbow Method for Curricular and Instructional considerations

Note. Within the cluster sum of squares (WCSS); 3 is provided for exploratory use; natural number of clusters is not known

ASSURE Guided Development and Platform Utilization

Implementation records included the six ASSURE stages. Analyse Learners found out the starting position of the target group and the educational background. The learning outcomes were linked to the competencies from Term 1 by the State Objectives. The LMS, readings, video, and assessment were selected based on choice from the methods, media and materials. Leverage the technical testing and lessons implemented using Media and Materials. Quizzes, Quick Checks, discussions, reflections, and applied exercises addressed require Learner Participation. The expert validation, feedback from the pilots and technical refinements were all considered part of Evaluate and Revise. These records are examples of the transparency of the instructional design process, and do not show the effect of one particular platform function.

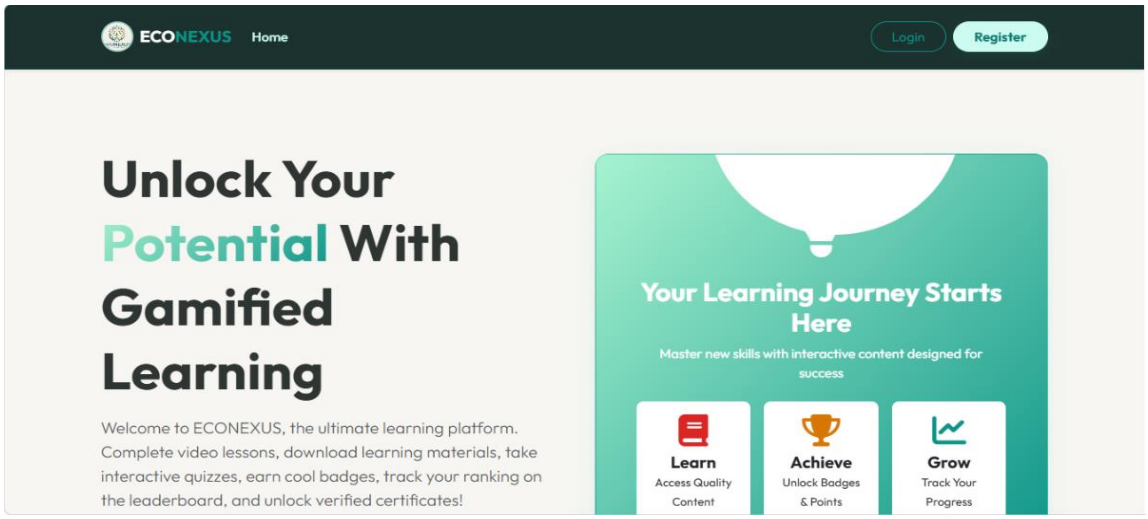

Figure 2. Public Homepage of Econexus Learning Hub

It included a dedicated user role access for site administrators, facilitators and students, as well as instructional files, notice boards, evaluations, performance badges, and activity trackers. The official Certificate of Utilization will confirm the deployment of the platform from July 28 to September 8, 2026, for Grade 9-Wisdom. This certification time interval does not equate to 30 days of instruction. Similarly, both the administrative certificate and interface visual snapshots do not provide login durations, module completion statistics or specific learning outcomes based on features used.

Academic Performance in Knowledge, Application, and Interpretation

A significant difference was found between the mean scores of the intervention and conventional groups in their initial testing, with the intervention group showing a much lower score than the conventional group (M = 25.52, SD = 7.40, MPS = 42.53%; M = 43.42, SD = 4.64, MPS = 72.36%). This pre-intervention discrepancy was expected as the group assignment was dependent on scores obtained on a pre-intervention test. Table 1 displays performance by assessment occasion and learning domain.

Table 1. Pretest and Posttest Performance by Group and Learning Domain

Group / test	Knowledge /30	Application /15	Interpretation /15	Overall M (SD) /60	Overall MPS
Intervention / Pretest	12.52	6.22	6.78	25.52 (7.40)	42.53%
Intervention / Posttest	19.04	11.41	11.93	42.37 (6.52)	70.62%
Conventional / Pretest	20.42	12.42	10.58	43.42 (4.64)	72.36%
Conventional / Posttest	19.50	11.92	12.50	43.92 (9.63)	73.19%

Note. The means are raw points and MPS = mean percentage score; n = 27 for intervention and n = 12 for conventional. Values come directly from the logs of the study testing.

In total, the intervention subgroup showed an overall gain in performance of 16.85 points, from 25.52 to 42.37 (MPS = 70.62%). The average scores of learning domains rose by 6.52 points in knowledge, 5.19 points in application and 5.15 points in interpretation (Growth in scores of about 21.73%, 34.60% and 34.33% compared to the maximum learning domain scores). In contrast, there was a small mean score change of 0.50 points in the traditional group (from 43.42 to 43.92). No individual statistical significance test was carried out in each of the skill categories and these domain-specific variations are therefore only descriptive. The overall increase of the intervention group's score is larger than the overall increase of the no-intervention group, as both groups had different baseline scores.

Inferential Comparisons

The results of the intervention subgroup showed a statistically significant difference in performance from pretest to posttest, $t(26) = -9.456$, $p < .001$, with a 95% confidence interval (CI) of [-20.515, -13.189]. The negative numbers sign are due to the subtraction sequence and represent a positive gain in post test score. However, there was no significant change for the conventional cohort, $t(11) = -0.163$, $p = .874$. This post test score comparison was also not significant, $t(37) = -0.588$, $p = .560$, between the intervention and conventional groups.

Table 2. Inferential Comparisons of Achievement Scores

Comparison	n	t (df)	p	95% CI for difference
Conventional pretest - posttest	12	-0.163 (11)	.874	[-7.265, 6.265]
Intervention pretest - posttest	27	-9.456 (26)	< .001	[-20.515, -13.189]
Posttest intervention - conventional	39	-0.588 (37)	.560	[-6.874, 3.781]

Note. In paired comparisons the pre-test values are subtracted from the post-test values. Independent posttest compares traditional group scores to intervention subgroup scores. The confidence intervals and statistical tests represent the output of the original study.

The mean difference was about -1.55 points (intervention minus conventional) with a 95% CI of [-6.874, 3.781]. Lack of statistical significance does not indicate group equivalence; nor does the intervention that is marked as having made a huge contribution indicate that the intervention directly contributed to the improvement in learning. The selection of the groups was not random; baseline scores were widely distributed and both groups engaged in regular classroom instruction. To assess the separate effect of the supplementary platform, there would need to be a comparable group of students from which a baseline measurement was taken and then compared to an equivalent group after the intervention

The results are consistent with current academic knowledge that structured educational intervention is important but should not be considered as a replicated controlled treatment effect. In the secondary school study in Hong Kong, Tang et al. (2024) reported that school support measures (including mentoring) were found to be key factors in the effectiveness of online courses. The challenges on the delivery of the Economics instructional strand and student achievement continue to be observed in local Philippine studies, too (Cabauatan & Dacles, 2021; Gauuan, 2023; Quirao et al., 2023). The overall weight of the current body of research supports the case for teacher guided supplemental instruction in practice but has enough variation in design that direct comparisons of effects are not possible.

Student Satisfaction and Practical Implications

Satisfaction ratings were generally high and evenly distributed across the intervention participants for all three categories of satisfaction (content, system, and site accessibility) and are summarized in Table 3. All the test areas were rated in the Strongly Agree range (3.25–4.00) on the four-point rating scale. These answers reflect very positive views of students on the course content, interaction with the platform, and ease of access. However, user satisfaction data doesn't show standards compliance for web accessibility, it doesn't guarantee no internet connection break, or it doesn't verify results of academic learning based on user acceptance.

Table 3. Student Satisfaction with Econexus by Dimension

Dimension	Mean	SD	Interpretation
Content	3.70	0.50	Strongly Agree
Usability	3.70	0.51	Strongly Agree
Accessibility	3.71	0.53	Strongly Agree

Note. Satisfaction questionnaire: 30 items, 4-point response scale; n = 27 (intervention-subgroup). The scores between 3.25-4.00 were considered to be Strongly Agree.

The consistency of the participant feedback and of the marked improvement in achievement across the subgroups lends continued credibility to Econexus as a supplemental source of learning for all its participants, not as a dominant lesson or instructional approach. Research on digital instruction has been separated from verified academic outcomes to

consider user satisfaction (Martin & Bolliger, 2022; Tang et al., 2023). To implement effectively, a school needs to attend to the process of curriculum mapping, continuous teacher feedback, access to appropriate hardware, and scaffolding. The recommendations are like UNESCO's (2023) suggestions that the evaluation of educational technologies should be done through their pedagogical alignment, fairness, and long-term sustainability.

Conclusion

The Econexus was developed and assessed as one of the supplementals, online resources to support the ASSURE framework for five units from the Economics curriculum (Grade 9). This preliminary document synthesis set up a clear ground for the sequence of modules and platform features. In all phases of implementation, lower scoring students who took Econexus in addition to regular class had statistically significant gains in test scores, and were very pleased with the platform content, usability of the platform and the accessibility of the site. But the non-significant post test difference between groups, and the whole evaluation model do not isolate a causal effect that can be attributed to the web platform alone.

Analysis of scaling and implementation for practical use. The expansion of the system should be done in steps and be well documented. First, the institution can test the modules in another Grade 9 section or in a similar academic setting, with proper training of the teacher(s) and verifying devices and networks and with standard testing protocols. Second, there should be a single user guide to explain the progression of the modules, the expectations of what learners should do each week, guidelines for giving feedback at the end of each week, and some options that help students if they have a limited choice of Internet connection. Third, the plan for tracking the system ought to incorporate metrics for user logins, study hours spent on the system, tasks completed, test attempts, and level of participation in discussions at regular intervals and ensure student data confidentiality. Fourth, tests of retention should be used to assess retention over time, and to inform content updates. Comparative study of the effectiveness of instruction will need to be done in larger groups with baseline-equivalency, and with baseline-adjusted statistical methods. This evaluation is limited using a criterion-based classification of the groups, the relatively low number of students in one institution, the great differences in pretest scores, the absence of information about changes in platform usage and the absence of a long-term assessment of students' retention. Furthermore, preliminary reliability measures for these measures need to be validated. These should accompany dissemination and/or any practical use of these findings.

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