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Innovated iPlan in computer-aided design (cad) for engineering and technology at the state university

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Abstract

This iPlan evaluated the efficacy of the recently established plan for engineering drawing. The lesson plan for effective instruction that was discussed above was impacted by Merill's four stages, which are activation, demonstration, application, and integration. The first quarter of the academic year 2018-2019 saw the participation of thirty college students from Jose Rizal Memorial State University in the survey. The purpose of the survey was to evaluate the efficiency of putting into practice the recently developed instructional plan (iPlan). The investigation of the aforementioned subject utilized the target data, a customized questionnaire that underwent both pilot testing and expert validation. Also, the dependability coefficient of 0.60 was calculated using 20 (KR20) on the previous equipment. We compared the experimental and controlled groups for both practical and theoretical performance, taking the mean of each version for each competency. We conducted this comparison with the experimental group. The data collection, analysis, and interpretation revealed that the innovated iPlan in Computer-Aided Design (CAD) significantly enhances student achievement. The completion of the aforementioned processes revealed this. Furthermore, it was evident that students were cooperative and involved throughout the entirety of the training stages, which demonstrated that they were having a positive time. We must recommend the cutting-edge iPlan to students at Jose Rizal Memorial State University because engineering drawing is suitable for each of Merill's four phases of education.

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Introduction

The instructor's ability to effectively incorporate the material they deliver to the class is crucial. The lesson plan focuses on enhancing a specific aspect of education or learning. It makes use of the pedagogy that is prevalent in instruction in this day and age. This exercise's instructional design exemplifies the ideal structure for education. As an instructional technique, plan outlines should be used with students and the intended framework. Reigeluth (2013) is cited. Numerous problems in the educational system have prompted the launch of several initiatives to improve instruction. We have developed an infinite number of different teaching programs to meet the requirements of each and every student. Conversely, areas that focus on enhancing capabilities, like vocational engineering education, have taken into account standardization. There has not been a clear instructional approach that has been implemented to assist the instructors in the process of developing their lectures, particularly in the field of computer-aided design, which is one of the required disciplines at the engineering vocational institution. The Commission on higher education has developed an overarching strategy that considers the projected learning outcomes for each individual course. It is a symptom of growing concerns that education in many public schools, particularly in computer-aided design, is insufficient.

The necessity for continual instructional plan development is a sign of this growing worry. Due to their persistent inability to comprehend the presented material, a significant number of students hold erroneous perceptions about their learning capabilities, posing a continuous challenge for the instructors. Since 2007, the number of high school students who have dropped out of school has been steadily increasing, as indicated by the data that is currently accessible from the department of education (Rep. Alfred Vargas III, 2016). Consider the fact that the instructional plan integrates the most crucial elements of the current curriculum, as outlined in the curriculum guide's performance standard and competencies. In addition, the iPlan is only compatible with the curriculum for grades K–12 and encapsulates the key ideas that students need to acquire in order to become proficient in a specific subject. The use of iPlan and the presence of the program demonstrate how well prepared a teacher is to deliver their lectures, despite the fact that iPlan requires sufficient time for preparation. The subjects for the first quarter of computer-aided design are lettering and drawing two-dimensional and three-dimensional objects.

The students studying these subjects were those studying engineering and technology. Their performance in the subject was subpar, as seen by their scores in these competencies. When an instructional plan was modified to the newly designed plan by the researcher, the researcher subsequently carried out this study to further assist the students in improving their performance.

The researcher's goal in this study is to create a computer-aided design lesson plan. The iPlan is based on the first principle of instruction by Merills, the CHED standards for lesson planning, and the competency-based learning materials for skills development from TESDA. The researcher will also evaluate the impact of using iPlans on students' performance in computer-aided design.

Theoretical background

Teachers can better comprehend the best format for education or teaching with the help of instructional theories. It offers strategies for educators to support students in achieving their learning goals. Adapting instructional theories takes into account the learning content and, more importantly, the preferred learning styles of the students. Teachers use them as tools or models to promote learning. Instructional theories cover various educational methodologies, concepts, and strategies.

The activation, demonstration, application, and integration phases are the four stages of effective instruction that David Merrill distinguished in his first principles of instruction. It is believed that the

theories are necessary for efficient and successful instruction. The majority of theories regarding the concepts examined in this study emphasize problem-centered training and parts of these four stages of effective education.

Theoretical framework

Theoretical framework is given below in Fig. 1.

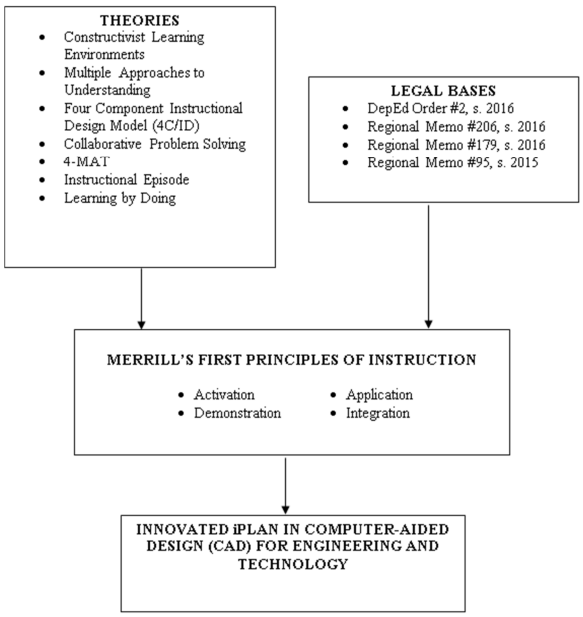

Fig. 1. Theoretical framework

Materials and methods

The study will compare the respondents' performance utilizing the traditional computer-aided design (CAD) lesson plan with the newly devised instructional plan (iPlan) employing Merill's first principles. The approval from Dr. Quindhe M. Banquiao, the Unit Head of the research ethics committee of the University, was sought before the conduct of the study. Furthermore, informed consent was obtained from all the participants requesting their voluntary participation in the experiment. The nature of the research was explained, the objectives and the processes were discussed, and confidentiality of whatever data or information to be obtained was strictly adhered to. Also, the participants were informed that they might withdraw from the experiment if they found the processes irrelevant and unnecessary.

Results and discussion

After explaining the concepts and addressing the necessary abilities to be improved, the respondents' posttest results were used to measure their degree of performance in both the theoretical and practical areas.

The total score of the pre/posttest performance is 58 which covers the competencies for lettering (26 pts.), sketching 2D (22 pts.), and sketching 3D (10 pts.). The target mean is 60% of the total points which is 34.80 pts.

Pretest performance of the respondents using the conventional iPlan in engineering drawing as to lettering, sketching 2o objects and sketching 3d objects

Before learning about the different engineering drawing competencies, students studying engineering and technology took the pretest. This is one method of evaluating the students' level of competency.

Table 1 summarizes the respondent's pretest performance before introducing the topics on lettering, 2D and 3D objects in engineering drawing for the first quarter, S.Y. 2018-2019.

From the Table 1, the respondents got 6.1, 3.0 /and 6.4 mean scores for the competencies: Apply the different styles of letters, perform the freehand sketch and perform the principles of orthographic projections with a total mean score of 15.5, which is below the total target mean of 34.8. It's because they only used the drawing-related knowledge they had learned in their engineering and technology classes.

According to Wyte-Lake *et al.* (2013), students have complained that traditional lecture-style methods of imparting information are ineffective, tedious, and amount to "death by PowerPoint." As a result, teachers must experiment with novel methods by assessing pedagogies that could improve student learning and teaching efficiency.

Table 1. Pretest mean scores of the respondents using the conventional iPlan in engineering and technology drawing as to lettering, 2d and 3d objects

Learning competencies	Highest possible score	Target mean score	Actual mean score
1. Apply the different styles of letters	22	13.2	6.1
2. Perform the freehand sketch (2D objects)	10	6.0	3.0
3. Perform the principles of orthographic projections (3D objects)	26	15.6	6.4
Totality	58	34.8	15.5

Table 2. Posttest mean scores of the respondents using the conventional iPlan in engineering and technology drawing as to lettering, 2d objects and 3d objects

Learning competencies	Highest possible score	Target mean score	Actual mean Score
1. Apply the different styles of letters	22	13.2	13.2
2. Perform the freehand sketch (2D objects)	10	6	5.4
3. Perform the principles of orthographic projections (3D objects)	26	15.6	12.0
Totality	58	34.8	31.0

Posttest performance of the respondents using the conventional iPlan in engineering and technology drawing as to lettering, 2D and 3D objects

The traditional instructional plan process was used to deliver the teaching to this group.

Following the discussion of the competencies, the following segments, which included exercises involving concepts and practical demonstrations, were conducted. A posttest was given about the skills in both theoretical and practical terms.

Table 2 shows the summary of the respondent's posttest performance using the conventional plan format on the topics on lettering, sketching 2-D, and 3-D objects. Engineering Drawing subject for the first quarter, S.Y. 2018-2019.

From the Table 2, the respondents got 13.2, 5.4 and 12.0 mean scores for the competencies: Apply the different styles of letters, perform the freehand sketch and perform the principles of orthographic projections respectively, the group got a total of 31.0 mean score during the posttest.

People learn at different rates and have distinct learning demands, one of the few things that almost everyone in education and training can agree on. On the contrary, a preset, fixed quantity of content is often taught in a predetermined length of time in our schools and training programs.

Slower learners inevitably have to move on before they have mastered the material. As a result, they have learning deficits that make it more challenging to acquire comparable material in the future. Additionally, faster learners get frustrated from being bored and lose a lot of time waiting for the group to move on. This represents a significant waste of talent that our communities, businesses, and society need. In a system intended to maximize learning, students would not be forced to move on before they had mastered the content at hand and would not be required to wait for the slower students to catch up (Reigeluth, 2012).

Pretest performance of the respondents using the newly developed iPlan in engineering and technology drawing as to lettering, 2d objects and 3d objects

Before learning about the different engineering drawing competencies, students studying Engineering and Technology took the pretest. This is one method of evaluating the pupils' knowledge of the mentioned competencies.

Table 3 shows the summary of respondent's pretest performance using the newly developed iPlan format on lettering, sketching 2-D and 3-D objects in

engineering and technology drawing subject for the first quarter, S.Y. 2018-2019.

From the Table 3, the respondents got 7.8, 4.0, and 6.6 mean scores for the competencies: Apply the different styles of letters, perform the freehand sketch and perform the principles of orthographic projections, respectively, with a total mean score of 18.4, which is below the total target mean score of 34.80. It's because they only used the drawing-related knowledge they had memorized from grade 10 classes.

Too often, in instructional planning, we focus on the small details (student activities and tasks) before we look at the larger picture (Harmon, 2012). The instructional plan (iPlan), which incorporates various activities to meet the needs of the learners, places a strong emphasis on the abilities and concepts that students should learn. This affects the performance depicted above.

The relevance of an emphasis on high-quality instruction in assisting students' accomplishment, which is stressed in the iPlan, has been underscored in numerous studies. Excellent teachers plan academic possibilities for students' improvement and enrichment. It is feasible to provide alternatives to a student or a small number of students who have grasped the topic more quickly than the rest of the class, thanks to the instructor's understanding of the students.

Table 3. Pretest mean scores of the respondents using the newly developed iPlan in engineering and technology drawing as to lettering, 2d objects and 3d objects

Learning competencies	Highest possible score	Target mean score	Actual mean score
1. Apply the different styles of letters	22	13.2	7.8
2. Perform the freehand sketch (2D objects)	10	6	4.0
3. Perform the principles of orthographic projections (3D objects)	26	15.6	6.6
Totality	58	34.8	18.4

Table 4. Posttest mean scores of the respondents using the newly developed iPlan in engineering and technology drawing as to lettering, 2d objects and 3d object

Learning competencies	Highest possible score	Target mean score	Actual mean score
1. Apply the different styles of letters	26	15.6	18.3
2. Perform the freehand sketch (2D objects)	22	13.2	18.4
3. Perform the principles of orthographic projections (3D objects)	10	6	7.3
Totality	58	34.8	44.0

Table 5. Comparison of the respondent's posttest actual mean scores

Learning Competencies	Target mean score	Actual mean scores	
		Conventional iPlan	Newly developed iPlan
1. Apply the different styles of letters	15.6	12.0	18.3
2. Perform the freehand sketch (2D objects)	13.2	13.2	18.4
3. Perform the principles of orthographic projections (3D objects	6	5.4	7.3
Totality	34.8	31.6	44.0

Posttest performance of the respondents using the newly developed iPlan in engineering and technology drawing as to lettering, 2d and 3d objects

In this group, the newly-developed instructional plan employing the four phases of Merill towards effective instruction was applied. The procedure of the instruction was different in comparison to the conventional instructional plan. The same set of test was given to this group. Table 4 shows the performance of the respondents in the post test using the newly developed instructional plan (iPlan).

The response of the respondents got beyond the target mean of 34.80. The respondents got 18.3, 18.4 and 7.3 mean scores for the competencies: Apply the different styles of letters, perform the freehand sketch and perform the principles of orthographic projections respectively, thus, the respondents got a total of 44.0 mean score. The researcher observed how the respondents enjoyed the various phases of instruction which made them perform well in the practical test.

This shows the need for the instructors to add some spice to the education, which is far different from the regular curriculum instructional plan. Although some respondents didn't like the subject, the phases showed their enthusiasm to learn about it. Facilities are not a question of maximizing learning. It will be how the instructors deal with the students for them to give more. Most of a student's time is spent performing authentic tasks rather than listening to instructors.

Some talk about task-based instruction in terms of the "student as worker" and the "instructors as manager," rather than the instructors as workers. This could be fitted to the various tasks the students must perform whenever they deal with the subject. Collaboration is essential in work life, civic life, and family life. Therefore, students need experience in collaborating on small teams. Team-based learning on a task provides an excellent opportunity for students to develop their collaboration skills. Still, it also provides a valuable opportunity for students to learn from each other.

Extent of the acquired identified competencies in engineering and technology drawing

This portion tells as to what extent the acquired identified competencies in engineering and technology drawing are. Table 5 shows the comparison of the performance of respondents using conventional and newly developed iPlans.

Competencies serve as the core skills needed for students to absorb. The table shows that the respondents were able to perform different lettering styles and techniques using the newly developed iPlan, for it has 18.3 higher mean in comparison to the conventional iPlan format.

Moreover, the respondents had sketched simple objects as justified in the result from the table.

The second competency got 18.4 mean higher in favor of the newly developed iPlan. Furthermore, the respondents performed freehand sketches when the newly developed iPlan format was employed. Thus, the respondents could perform the said identified competencies using the newly developed iPlan.

Conclusion

It was clear that the newly developed instructional plan (iPlan) is more successful in teaching the Engineering and Technology Drawing topic than the conventional instructional plan based on the analysis and interpretation of the data. The respondents found the entire procedure enjoyable thanks to the phases of instruction employed as the steps for maximizing learning. Furthermore, because their requirements were met by their capacity to learn, the respondents felt more at ease with the topic thanks to this innovative method.

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