

# DEVELOPMENT OF FLIPPED CLASSROOM INSTRUCTIONAL MODEL TO ENHANCE UNDERGRADUATE STUDENTS' PROBLEM-SOLVING SKILLS



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## Abstract

This thesis aims to 3 objectives 1) To study the factors to enhance undergraduate students' problem-solving skills 2) To develop flipped classroom instructional model to enhance undergraduate students 'problem-solving skills 3) To examine the results implementing flipped classroom instructional model to enhance undergraduate students' problem-solving skills. There are 3 phases was conducted to answer research objectives 1, 2, 3. Sample group in phase 1 is former students of Computer Application Basics course in semester I of academic year 2021 and the lecturers who are teaching Computer Application Basics course from 3 colleges in Qingdao Huanghai University. Sample group in phase 2 is the confirming on instructional model and sample group in phase 3 is 38 students who enroll in Computer Application Basics course from Qingdao Huanghai University. The research tools included questionnaires for students, interviews for teachers, Conformity Assessment Form of Flipped Classroom Instructional Model, lesson plans using flipped classroom instructional model, and "rubric scoring form. The statistics were mean, standard deviation, and frequency, percentage, and Item-Objective Congruence (IOC).

The research results showed that: 1) There are internal and external factors to improve problem-solving skills of students in Qingdao Huanghai University. In overall, internal factors affecting the learning achievement of the Computer Application Basics course are found to be at a high level overall, 2) Confirming flipped classroom instructional model in terms of accuracy, propriety, feasibility, and utility 100 %, and 3) The result of implementing the flipped classroom instructional model found that 25 were good (83.3%), 1 were average (3%), and 4 were passing (4%).

**Keywords:** Flipped Classroom, Instructional Model, Problem-Solving Skills

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## Introduction

In today's rapidly evolving global context, Chinese students need to develop problem-solving skills as the country shifts towards technology-intensive industries (National Bureau of Statistics of China, 2023). The Chinese government has initiated educational reforms, such as the National Medium- and Long-term Education Reform and Development Plan (2010-2020), to cultivate innovative and practical talents for future socioeconomic development (Ministry of Education of the People's Republic of China, 2010).

Students in the Computer Application Basics course often face challenges in developing problem-solving skills due to factors like inadequate prior knowledge, limited independent thinking experience, and insufficient exposure to practical applications (Savage, 2014; Zhang, 2017). The development of problem-solving skills in the Computer Application Basics course has become a pressing issue for educators, attributed to factors such as students' lack of prior knowledge, limited independent thinking experience, and insufficient exposure to practical applications of course materials (Barron & Darling-Hammond, 2010).

To enhance students' problem-solving skills, educators can employ various teaching approaches, such as offering ample practice opportunities, instructing problem-solving strategies and techniques, encouraging collaboration, and leveraging technology. One effective method is implementing mini-video assignments, which involve selecting a problem, planning and designing solutions, collecting materials, producing videos, reviewing and revising, and sharing and discussing with peers (Computer Application Basics course, 2019). This approach encourages students to apply their technical knowledge to real-world problems while fostering creative and critical thinking skills.

Recent studies have highlighted the effectiveness of the flipped classroom model and thinking classroom model in enhancing problem-solving skills. Liljedahl (2016) found that the thinking classroom approach effectively enhanced undergraduate students' problem-solving skills by fostering a collaborative and supportive learning environment. Similarly, Talbert's (2017) study of the flipped classroom model found that it improved students' problem-solving abilities by emphasizing student-centeredness and active learning. Furthermore, Teach Thought (2013) analyzed the flipped classroom and thinking classroom models and found that these approaches significantly improved undergraduate students' problem-solving skills by emphasizing student-centeredness, diversified learning resources, effective communication, interaction, and timely feedback.

With this realization, it's vital to study "Development of Flipped Classroom Instructional Model to Enhance Undergraduate Students' Problem-Solving Skills."

## Objectives

1. To examine factors to enhance undergraduate students' problem-solving skills.
2. To develop flipped classroom instructional model to enhance undergraduate students' problem-solving skills.
3. To study the results implementing flipped classroom instructional model to enhance undergraduate students' problem-solving skills.

## Material and Method

### Literature review

### Instructional model development

To develop an effective instructional model, I brought together five experts in the field of education, each from a different disciplinary background. Through interdisciplinary collaboration, we discussed and analyzed key elements of an instructional model, such as

instructional strategies, assessment methods, and technological tools. After intensive discussion and reflection, the combined efforts of these five experts led to a carefully designed instructional model that is effective in improving student learning outcomes. This model is based on the latest educational research and practice and is designed to provide teachers and scholars with a reliable framework to support students' cognitive development and lifelong learning. And that instructional model development means creating and refining online learning environments that cater to learners' cognitive processes, maximize engagement, and enhance learning outcomes. This involves understanding and implementing strategies such as reducing cognitive load, utilizing multimedia materials, enabling personalized learning, encouraging social interaction, providing dynamic learning materials, and implementing educational assessment and feedback. By taking these factors into account, instructional models can be designed to optimize learning experiences and improve learner satisfaction.

Paul (2006) said that instructional model development means creating effective teaching strategies that address the shortcomings of minimally guided pedagogies, such as constructivist, discovery, problem-based, experiential, and inquiry-based approaches. By focusing on the importance of learners' prior knowledge, guided instruction, structured tasks, and problem-solving strategies, instructional models can provide the necessary support for students to successfully process and acquire new knowledge during cognitive processes. This development also involves promoting evidence-based educational practices, ensuring that the instructional methods implemented in classrooms are backed by empirical research and have demonstrated positive results. In summary, instructional model development, as described by emphasizes the need for a pedagogical framework that reduces cognitive load, enhances learner outcomes, and is grounded in solid evidence.

The researcher summarizes the theory of instructional model development as a systematic approach to designing and refining effective teaching and learning strategies. This involves considering key factors such as reducing cognitive load, utilizing multimedia learning materials, enabling personalized learning, encouraging social interaction, providing dynamic learning materials, implementing educational assessment and feedback, and understanding cognitive theories such as cognitive load theory and multimedia learning theory. The theory emphasizes the importance of designing learning tasks and activities that promote higher levels of cognitive engagement, minimize passive learning, and foster interactive, constructive, and active learning behaviors. It also emphasizes the importance of providing ongoing and personalized feedback to improve student learning outcomes. Additionally, the theory highlights the need to consider the characteristics of complex learning and provides a structured framework for instructional design, such as the Ten Steps to Complex Learning approach based on the Four Component Instructional Design (4C/ID) model. By integrating theoretical foundations with practical applications, instructional model development aims to optimize teaching and learning experiences and improve learner satisfaction and outcomes.

### **Flipped classroom instruction model**

Talbert (2017) said that the flipped classroom instruction model is a student-centered approach to learning that emphasizes active engagement and the effective use of technology.

In a flipped classroom, students engage with pre-class materials to acquire foundational knowledge before class, and then participate in in-class activities that promote higher-order thinking and problem-solving skills. This approach allows for more personalized learning experiences and provides students with more opportunities to engage in active learning and receive timely feedback. Successful implementation of flipped classrooms requires careful planning, clear learning objectives, and effective use of technology to support student learning. Assessment in flipped classrooms should be aligned with learning objectives and provide timely feedback to guide student learning and improvement.

Overall, these steps involve careful planning and intentional design of the flipped learning experience, leveraging technology and active learning strategies to engage students

and promote their mastery of learning objectives. By following these steps, educators can create effective flipped classrooms that enhance student learning outcomes and engagement.

### **Problem solving skills**

Sihotang, Mulyono, Ani Minarni, & Tamba (2019) said that Problem-solving skills means problem-solving skills refer to the ability to navigate, analyze, and synthesize information, and apply critical thinking to solve complex problems effectively. These skills are essential for success in various contexts, including academic, professional, and personal settings. The flipped classroom model using WebQuests based on constructivist theory aims to foster these competencies by promoting active learning, collaboration, and reflection, allowing students to construct their knowledge actively, and providing opportunities to develop and apply problem-solving skills in a supportive learning environment. Ultimately, the goal is to prepare students for the challenges they will face in the future by empowering them with the problem-solving skills they need to succeed.

In summary, problem-solving skills are essential competencies for success in various contexts, including academic, professional, and personal settings. The flipped classroom model, with its focus on active learning, collaboration, and reflection, is an effective approach for fostering problem-solving skills. The integration of Webquests based on constructivist theory, ubiquitous learning, and the scientific learning process, as proposed by Sihotang, Mulyono, Ani Minarni, & Tamba (2019), can further enhance the effectiveness of the flipped classroom model in promoting problem-solving skills. Critical problem-solving activities, as suggested by Chavangklang & Suppasetserree (2018), can engage students in real-world tasks and promote higher-order thinking, allowing them to develop and apply their problem-solving skills effectively. Overall, the integration of these instructional approaches provides students with the tools they need to succeed in their future careers and lives.

## **Material and Method**

This research used Mixed Method of Research. This research is divided into 3 phases.

**Phase 1** was conducted to answer research objective 1: To study the factors to enhance undergraduate students' problem-solving skills.

### **Population**

**Group 1:** Former 150 undergraduate students' year 1 of Computer Application Basics course, semester 2 on academic year 2023 in Qingdao Huanghai University.

Class 1: 50 students major in Computer Science and Technology

Class 2: 50 students major in Software Engineering

Class 3: 50 students major in Information Security

### **Research Instruments**

The questionnaire for students

#### **Designing instrument 1**

1. Study Computer Application Basics course and factors affecting undergraduate students' problem-solving skills.

2. Design a questionnaire on factors to improve undergraduate students' problem-solving skills for the students at Qingdao Huanghai University.

3. Present the draft of questionnaire to the advisors for checking correctness and completion.

4. Assess the validity of questionnaire on factors to improve undergraduate students' problem-solving skills for the students at Qingdao Huanghai University by 5 experts.

5. Design Likert 5-point rating scale questionnaire on the following score rating criteria.

### **Data Collection**

1. Ask for permission for data collection.
2. Collect data from the assigned students using the developed questionnaire.

### **Data Analysis**

Descriptive Statistics i.e., Frequency, MEAN ( $\mu$ ), Standard Deviation ( $\sigma$ )

**Group 2:** The lecturers who are teaching of Computer Application Basics course from 3 colleges in Qingdao Huanghai University.

- 1) 1 Lecturer from majoring in Computer Science and Technology
- 2) 1 Lecturer from majoring in Software Engineering and
- 3) 1 Lecturer from majoring in Information Security.

### **Research instrument**

The interview for the lecturers

### **Designing instrument 2**

1. Study Computer Application Basics course and factors affecting undergraduate students' problem-solving skills.
2. Design a questionnaire on factors to improve undergraduate students' problem-solving skills for the students at Qingdao Huanghai University.
3. Present the draft of questionnaire to the advisors for checking correctness and completion.
4. Assess the validity of questionnaire on factors to improve undergraduate students' problem-solving skills for the students at Qingdao Huanghai University by 5 experts.

### **Data Collection**

1. Ask for permission for data collection.
2. Collect data from the assigned lecturers using the developed interview.

### **Data Analysis**

Content analysis

### **Designing instrument 2**

1. Study literature on problem-solving skills, improve of undergraduate students' problem-solving skills", and factors affecting the enhancement of problem-solving skills in undergraduates.
2. Design the draft of open-ended interview on factors affecting problem-solving skills in undergraduate students.
3. Present the draft of open-ended interview to the advisors for checking correctness and completion.
4. Assess the validity of open-end interview on factors affecting problem-solving skills for the students at Qingdao Huanghai University by 5 experts

### **Data Collection**

1. Ask for permission for data collection.
2. Collect data from the assigned lecturers using the developed interview.

### **Data Analysis**

Content analysis

### **Expected Output Phase 1**

Factors affecting undergraduate students' problem-solving skills.

**Phase 2** was conducted to answer research objective 2: "To develop flipped classroom instructional model to enhance undergraduate students' problem-solving skills"

**Research instrument**

Conformity Assessment Form of Flipped Classroom Instructional Model in terms of accuracy standard, propriety standard, feasibility standard, and utility standard.

**Designing instrument**

1. Study related concepts, principles, process about developing instructional model, including results in terms of factors affecting "problem-solving skills" from research objective 1.

2. Design handout of "Flipped Classroom" instructional model.

3. Design a questionnaire on confirming the appropriateness of the instructional model in terms of accuracy standard, propriety standard, feasibility standard, and utility standard.

4. Present the draft of open-ended interview to the advisors for checking correctness and completion.

5. Assess the validity of the questionnaire on confirming the appropriateness of the instructional model by 5 experts

6. Design the conformity assessment form of "Flipped Classroom" instructional model.

**Data Collection**

1. Ask for permission of data collection

2. Collect appropriateness of the instructional model in terms of accuracy standard, propriety standard, feasibility standard, and utility standard from the 5 experts using the developed conformity assessment form of "Flipped Classroom" instructional model.

**Data Analysis**

Descriptive analysis i.e., frequency and percentage. The acceptable items must not be less than 100%.

**Expected Output Phase 2**

Flipped Classroom instructional model the appropriateness of which is confirmed by experts for further implementation.

**Phase 3** was conducted to answer research objective 3: To study the results of implementing flipped classroom instructional model to enhance undergraduate students' problem-solving skills.

**Population**

The total of 60 students from 2 classes of students with different levels of proficiency – beginner, intermediate, and advanced, who enrolled in Computer Application Basics Course at Qingdao Huanghai University in semester 1 academic year 2023. Those sections involve are 30 students in Class A, and 30 students in Class B

**The Sample Group**

The 30 students who enroll in the basics of computer applications course from Class A by simple random sampling.

**Research instruments**

1. Lesson plans using flipped classroom instructional model

2. Rubric scoring form

**Designing instrument 1**

1. Study contents, objectives, methods of teaching, materials, evaluation and learner assessment methods.

2. Design lesson plans by format given.

3. Present the lesson plan to the advisors for checking correctness, completion and improvement.

4. Assess the validity of the designed lesson plans by 5 experts

**Designing instrument 2**

Rubric scoring form

1. Study the rubric scoring criteria aligned with the Flipped Classroom Instructional Model.

2. Design rubric scoring criteria.
3. Present the developed rubric scoring criteria to the advisors for checking correctness, completion and improvement.
4. Assess the validity of the designed rubric scoring criteria by 5 experts through Item-Objective Congruence (IOC)

#### **Data Collection**

1. Ask for permission of data collection
2. Collect students' performance by using rubric scoring before assessment by external raters.

#### **Data Analysis**

Categorize students' performance according to rubric scoring criteria into their levels descriptor.

#### **Expected Output Phase 3 (Rubric Scoring Criteria)**

Results of implementing Flipped Classroom Instructional Model" – students' performance according to rubric scoring criteria into their levels descriptor.

## **Results and Discussion**

In the study of "Development of flipped classroom instructional model to enhance undergraduate students' problem - solving skills", the researcher studied the documents concerning the following.

**Part 1:** Analysis results serving objective 1–To examine the factors to enhance learning achievement for undergraduate students in Qingdao Huanghai University.

This section presents analysis results serving objective 1 using table and description in terms of MEAN, standard deviation, interpretation (Level of Attitude), and ranking of all factors in overview. After that, items of all factors are presented likewise

#### **Common data of the respondent in overall (N=150)**

The common data of the respondent in overall shows that about two-thirds of the respondents are female, representing 66.7% of the total participants. The male respondents make up 33.3% of the total. The age distribution is relatively evenly spread out, with the age range of 19-20 years being the most common, with 33.3% of the respondents falling in this category.

#### **The result of questionnaire from students in overview (N-150)**

The indicates that internal factors affecting the learning achievement of the Computer Application Basics course are found to be at a high level overall ( $\mu=3.89$ ). Considering each item individually, it was found that No.1 Students are very interested in the flipped classroom instructional model in the Computer Application Basics course and No.15 Students respect and trust their teachers' expertise in organizing and managing the flipped classroom model. have the highest mean ( $\mu=4.10$ ), followed by No.5 Students believe that flipped classroom and online learning can help them improve their problem-solving skills. ( $\mu=4.04$ ), and the lowest mean is No.8 Students appreciate the cooperative and interactive learning environment fostered by the flipped classroom model. ( $\mu= 3.64$ ).

For external factors affecting the learning achievement of the Computer Application Basics course, the overall level is found to be moderate ( $\mu=3.81$ ). Considering each item individually, it was found that No.24 The teaching methods employed in the flipped classroom model align with the course objectives and content has the highest mean ( $\mu=3.94$ ), followed by No.28 Course materials include a combination of traditional textbooks and online resources to broaden students' knowledge and exposure to computer applications and problem-solving techniques. ( $\mu= 3.90$ ), and the lowest mean is No.26 Course materials and presentations are carefully designed, well-organized, and visually appealing. ( $\mu= 3.70$ ).

**The Common data of the respondent in A. major in Computer Science and Technology. (N=50)**

The common data of the respondent majoring in Computer Science and Technology the most gender is female, 54%. The most age is 19-20 yrs, 68%.

**The result of questionnaire from students in A. major in Computer Science and Technology. (N=50)**

The indicates that internal factors affecting the Computer Application Basics course enhance learning achievement of undergraduate students overall found at a high level ( $\mu=3.98$ ). Considering only each item, it was found that No. 1 Students are very interested in the flipped classroom instructional model in the Computer Application Basics course has the highest mean ( $\mu=4.08$ ), followed by No. 3 Students clearly understand the importance of developing problem-solving skills in the Computer Application Basics course ( $\mu=4.06$ ) and the lowest mean is No. 2 Students actively participate in problem-solving activities and discussions through online platforms. ( $\mu=3.78$ ).

For external factors affecting the Computer Application Basics course enhance learning achievement of undergraduate students overall found at a moderate level ( $\mu=3.78$ ). Considering only each item, it was found that No. 26 Course materials and presentations are carefully designed, well-organized, and visually appealing has the highest mean ( $\mu=3.80$ ), followed by No. 21 The lecturers treat each student equally, fostering confidence and reducing anxiety in problem-solving activities ( $\mu=3.82$ ) and the lowest mean is No. 18 The lecturers' evaluation methods include formative and summative assessments, incorporating various types of tasks and assignments. ( $\mu=3.66$ ).

**Common data of the respondent in B. majoring in Software Engineering. (N=50)**

The common data of the respondent majoring in Software Engineering the most gender is female, 54%. The most age is 19-20 yrs., 68%.

**The result of questionnaire from students majoring in Software Engineering (N=50)**

The Indicates that internal factors affecting ancient Chinese reading summarizing ability of indicates that internal factors affecting the Computer Application Basics course enhance learning achievement of majoring in Software Engineering overall found at a high level ( $\mu=3.92$ ). Considering each item individually, it was found that NO. 3 Students clearly understand the importance of developing problem-solving skills in the Computer Application Basics course has the highest mean ( $\mu=4.03$ ), followed by NO.1 Students are very interested in the flipped classroom instructional model in the Computer Application Basics course. ( $\mu=4.00$ ), and the lowest mean is NO. 6 Students think that the assignments provided by teachers and the feedback received can help them better apply their knowledge to real-world situations ( $\mu=3.81$ ).

For external factors affecting the Computer Application Basics course, learning achievement of majoring in Software Engineering overall is found at a high level ( $\mu=3.92$ ). Considering each item individually, it was found that NO. 17 The lecturers pay close attention to students' engagement and participation in course activities has the highest mean ( $\mu=3.97$ ), followed by NO. 16 The lecturers utilize modern instructional approaches, such as video lectures, computer simulations, to engage students in problem-solving activities ( $\mu=3.91$ ), and the lowest mean is NO. 23 The lecturers provide appropriate feedback to students using various methods, such as face-to-face communication, written comments, and voice or video messages ( $\mu=3.86$ ).

**The Common data of the respondent in C. majoring in Information Security. (N=50)**

The common data of the respondent majoring in Software Engineering. the most gender is female, 84% the most age is 19-20 yrs., 72%

**The result of questionnaire from students majoring in Information Security. (N=50)**

The indicates that internal factors affecting Computer Application Basics course learning achievement of majoring in Information Security are overall at a high level ( $\mu=3.86$ ).



Considering each item individually, it was found that No.1 Students are very interested in the flipped classroom instructional model in the Computer Application Basics course has the highest mean ( $\mu= 3.96$ ), followed by No.11 Students can effectively prepare for the course by completing pre-class tasks and assignments ( $\mu=3.94$ ), and the lowest mean is No.8 Students appreciate the cooperative and interactive learning environment fostered by the flipped classroom model. ( $\mu=3.64$ ).

For external factors affecting Computer Application Basics course learning achievement of majoring in Information Security, the overall level is moderate ( $\mu= 3.74$ ). Considering each item individually, it was found that No.30 The university provides a stable and high-speed network throughout the campus, ensuring smooth access to online learning resources and supporting the flipped classroom model has the highest mean ( $\mu=3.84$ ), followed by No.22 The lecturers combine traditional classroom assessments with modern online assessment systems to evaluate students' learning progress ( $\mu=3.84$ ), and the fewest mean is No.18 The lecturers' evaluation methods include formative and summative assessments, incorporating various types of tasks and assignments. ( $\mu=3.68$ ).

### **Interview Results**

After the results from interview with the 3 lecturers, the factors affecting Students' problem-solving skills can be concluded as follows.

#### **Internal Factors:**

**Physical:** All three lecturers employ active teaching methodologies that likely require a certain level of physical engagement from students, including interactive lectures, hands-on lab sessions, and practical projects. This engagement may help students stay focused and retain information better. Furthermore, the requirement of physical presence in lab sessions and class discussions underlines the importance of health and stamina.

**Psychological:** Each lecturer employs strategies to enhance students' motivation and interest in the subject. For instance, Lecturer A incorporates real-world applications and problems into assignments and coding competitions, while Lecturer B uses a project-based approach and encourages peer collaboration. Lecturer C engages students through real-world security scenarios, simulations, and cybersecurity competitions. These strategies likely promote a positive learning mindset and boost students' confidence and problem-solving abilities.

#### **External Factors:**

**Social environment:** All three lecturers promote an interactive and collaborative learning environment. They encourage group discussions, peer reviews, and collaborative projects, which can enhance students' social interaction, teamwork skills, and mutual learning.

**Materials:** Each lecturer uses a variety of instructional materials, including lecture notes, online resources, coding platforms, software engineering tools, and simulations. These materials are used to facilitate learning, illustrate complex concepts, and enable students to apply their knowledge in practical tasks.

**Teaching Methods:** The lecturers use a range of teaching methods tailored to their specific courses. These include interactive lectures, flipped classroom approach, project-based learning, and blended learning approaches that combine lectures, online resources, and hands-on activities.

**Class size:** While not directly mentioned, class size can potentially impact teaching methods and student engagement. A smaller class size might allow for more personalized attention and interactive learning experiences, while a larger class size might necessitate more lecture-based teaching and independent learning.

**Evaluation:** All lecturers employ a mixture of formative and summative assessments, including exams, assignments, and projects. These evaluations not only measure students' understanding and skill levels but also provide opportunities for feedback and improvement. Peer reviews and presentations are also used as forms of assessment, allowing for student self-reflection and peer learning.

In summary, these internal and external factors highlight the complex interplay between a student's physical and psychological state, the social learning environment, available learning materials, teaching methods, class size, and evaluation methods in shaping their learning outcomes and experiences.

That mention for the evident that internal factors affecting students' learning involve their motivation and interest. Lecturers utilize strategies such as real-world applications and project-based approaches, while students actively participate in problem-solving activities. This results in a positive learning mindset and improved problem-solving abilities.

External factors, such as equal treatment, social environment, course materials, class size, infrastructure, and evaluation, also play a significant role in students' learning experiences. Students prefer equal treatment and an interactive learning environment that enhances social interaction and teamwork skills. Well-designed materials contribute to effective learning, with class size impacting teaching methods and engagement. A stable, high-speed campus network supports various teaching methods and assessments, benefiting both students and lecturers.

## Analysis conclusion

### Conclusion

The result in the study of “Development of flipped classroom instructional model to enhance undergraduate students’ problem - solving skills”, the researcher presented the documents concerning the following.

**Part 1:** Analysis results serving objective 1. To study the factors to enhance undergraduate students’ problem-solving skills

The factors which promote learning achievement in the Computer Application Basics course encompass two main categories: Internal factors and external factors.

For internal factors affecting learning achievement, data analysis results reveal several significant elements. These factors are indicative of the students' engagement and perspective on the instructional model, particularly the flipped classroom model. The results highlight that students are very interested in the flipped classroom instructional model and highly respect and trust their teachers' expertise in organizing and managing this method ( $\mu=4.10$ ). Other influential internal factors include the belief that flipped classrooms and online learning can help improve problem-solving skills ( $\mu=4.04$ ), and the lowest mean, representative of students' appreciation for the cooperative and interactive learning environment, is found at 3.64.

On the external front, factors related to the learning achievement of the Computer Application Basics course are found to be moderate ( $\mu=3.81$ ). These include Teaching Methods (such as the alignment of the flipped classroom model with course objectives and content,  $\mu=3.94$ ), Course Materials (a combination of traditional textbooks and online resources,  $\mu=3.90$ ), and Learning Environment (including the necessity of well-maintained classrooms and multimedia facilities,  $\mu=3.87$ ). The lowest mean is observed in the design and organization of course materials and presentations ( $\mu=3.70$ ).

In summary, the internal and external factors influencing the learning achievement in the Computer Application Basics course offer a multifaceted understanding of students' engagement, the efficacy of teaching methods, and the integration of technology. This analytical approach provides insightful observations and indicates areas of further exploration to enhance learning outcomes in this technological educational landscape.

**Part 2:** Analysis results serving objective 2–To develop flipped classroom instructional model to enhance undergraduate students’ problem-solving skills.

Overall, the 5 components of the instructional model – principle and rationale, objectives, contents, methods of teaching & materials, and evaluation are unanimously confirmed by 5 specialists or 100% of all specialists based on appropriateness in 4 areas: utility, feasibility, propriety, and accuracy.

**Part 3:** Analysis results serving objective 3–To develop flipped classroom instructional model to enhance undergraduate students’ problem-solving skills.

Research findings among 30 students reveal that 83.33% demonstrated good problem-solving skills, with 25 at a good level, 1 at medium, and 4 at pass level, while none were at a poor level. Overall, this indicates that the implementation of the flipped classroom instructional model has led to an improvement in students' problem-solving abilities, aligning with the hypothesis that predicted an overall improvement of 80% to a good level or higher, thus affirming the effectiveness of this instructional approach.

According to the holistic RSA results, indicates that after implementing flipped classroom instructional model, students’ performance assessed by analytic RSA at Excellent level ( $\bar{x} = 11.86$ ). and holistic rubric-scoring at Good level ( $\bar{x} = 35.57$ ). For analytic RSA results, Attitude and values is the aspect the students can develop most obviously followed by Process and methods and Knowledge and skills.

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