

# STUDENTS' REFLECTIONS ON AN INTEGRATED RESEARCH SUBJECT USING A RESEARCH-BASED LEARNING ONLINE MODEL DURING THE COVID-19 PANDEMIC: A QUALITATIVE STUDY IN THAILAND

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## ABSTRACT

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Online education has become an important method of learning during the outbreak of COVID-19. The integrated research subject on research-based learning online (IRS-RBLO) model is an important active learning method for research methodology and research projects in the public health program. This study aimed to explore students' reflections both before and after the completion of an IRS-RBLO course. Employing a qualitative approach, a retrospective record review of open-ended questionnaires was conducted to explore the reflections of students in the field of community public health, both before and after their learning experiences. Thematic analysis was employed to analyze the collected data, and a trustworthiness technique was implemented to ensure the validity of the identified themes. The study yielded findings from a cohort of 80 4th year university public health students. Prior to the intervention, an examination of the students' reflections encompassed five themes related to their challenges, as well as five themes pertaining to suggestions for improvement. Furthermore, an assessment was conducted on the areas where students sought support, which included the research advisor, the academic program, and the school/university, resulting in the identification of 5, 4, and 2 themes respectively. After learning the IRS-RBLO, the students reflected that they had good experiences with four themes while the other four themes needed to be improved for a better learning experience. Moreover, 20 learning experience activities were completed in 16 weeks. All stakeholders must formulate learning activities that are grounded in their students' issues, suggestions, requirements, and consideration should be given to both the research advisors and the program within the university's School of Public Health. Particularly, the university or school's policy regarding the quality of learning is an important factor for the lecturers of the program for designing the course.

**Keywords:** Student reflection; experience; research-based learning online; COVID-19 pandemic; qualitative study

## 1. INTRODUCTION

The outbreak of the coronavirus disease (COVID-19) in 2019 led to a significant shift towards online education as a primary mode of learning (Alghamdi, 2021). The pandemic necessitated immediate adjustments in social behavior, economy, and lifestyle to mitigate its spread (World Health Organization [WHO], 2020). Online learning is an innovative approach aimed at enhancing learning outcomes (Lampton & Bartolo, 2012). Various pedagogical strategies, such as web-based learning, video demonstrations, instructor's notes, mini-projects, and online discussion forums, have been incorporated into the design of online courses (Yang, 2017). Furthermore, information communication technology plays a crucial role in delivering knowledge in the digital era, facilitating the transformation of the learning environment, engaging learners, providing online learning materials, and developing 21st-century competencies (Malik, 2018).

Research-based learning (RBL) seeks to promote and develop students' research competencies, making research valuable in six ways: 1) incorporating personal research into course design and teaching, 2) involving students in departmental research projects, 3) explicitly teaching research methods, techniques, and skills within programs, 4) integrating small-scale research activities into undergraduate assignments, 5) involving students in the research culture of departments, and 6) instilling the values of researchers in students (Arora et al., 2017). RBL differs from traditional methods as instructors must establish meaningful connections with learners to bridge the gap between research and practice (Healey & Jenkins, 2009; Jenkins & Healey, 2010).

Previous studies have explored active learning in education, including a study conducted with engineering students at Tecnológico de Monterrey, Mexico City Campus. The results indicated a four-step process: 1) assessing students' RBL competencies, 2) conducting an introductory workshop on research methodology by the teacher, 3) guiding students through a monograph design, and 4) enabling students to prepare a research project, including a research paper outline and a written and oral presentation to a jury of staff research professors (Noguez & Neri, 2019). This study spanned 14 weeks of teaching and focused on a small group without fieldwork practice. Similarly, another study aimed to develop an RBL model for comparison with the general teaching style among diploma students. The findings revealed that teachers possessed high levels of teaching skills, and students successfully completed their research work, meeting the required criteria (78.79%). Six outstanding works were even submitted for publication (Jiraro et al., 2020). While the main teaching outcomes in these studies aligned with educational standards and included elements such as research reports, research articles, and researchers' knowledge, they did not explore students' reflections on their learning experiences, including their feelings towards problems, solutions, needs, and understanding of the learning process. Such experiences are integral to the learning process (Roth & Jornet, 2014) and are highly individualized (Laverty, 2003).

In Thailand, there has been an ongoing outbreak of COVID-19 (Department of Disease Control [DDC], 2022), which has significantly changed the way people live, introducing a new normal (WHO, 2021). The School of Public Health involved in this study adopted the UK Professional Standards Framework (UKPSF) and the Thai Qualifications Framework for Higher Education (TQF: HEd.) (Khamchan et al., 2022) to provide a quality education. As a response to the COVID-19 crisis, online education was implemented as a transitional measure. The community public health program at the School of Public Health in this study adapted its learning model to this new context, resulting in the development of the integrated research subject on research-based learning online (IRS-RBLO) model, which is fully delivered online.

The IRS-RBLO model places a strong emphasis on instilling the values of a researcher in learners. Unlike traditional pedagogical methods, this course promotes research connections and conduct through various online learning platforms, including web-based learning, video demonstrations, instructor's notes, mini-projects, and online discussion forums. The IRS-RBLO model comprises three phases: design and planning, teaching and support, and evaluation. The course content and practice of IRS-RBLO includes five chapters: Introduction; Literature Review; Methodology; Results and Discussion; and Conclusions, Limitations, and Suggestions. The objectives of IRS-RBLO are specific, requiring each group of students (three students per group) to develop a research proposal, a full research report, and an oral research presentation within a 16-week timeframe.

The learning process is divided into three phases: preparation, teaching and learning, and evaluation. Each teaching week incorporated various online activities, such as reviewing the previous session's content, presenting research material, engaging in group work presentations and discussions, quizzes, progress monitoring, feedback provision, and tests. Notably, the research proposals and oral research presentations of each group underwent evaluation by a committee of three experts. However, this integrated course design arrangement for community public health students, fully delivered online, was a response to the

unprecedented challenges posed by the COVID-19 crisis. The learning outcomes of the students encompassed various factors, and it was important to explore their experiences to improve the learning design pattern.

The School of Public Health in this study, which is located within a university located in southern Thailand, was an early adopter of the UKPSF. The UKPSF in the first semester of the academic year 2022 capitalized on five areas of teaching activities: 1) design and plan learning activities and/or programs of study, 2) teach and/or support learning, 3) assess and give feedback to learners, 4) develop effective learning environments and approaches to student support and guidance, and 5) engage in continuing professional development (*UKPSF Dimensions of the Framework*, 2020). Further, the TQF: HEd consisted of five aspects: 1) ethics, 2) knowledge, 3) intellectual skills, 4) interpersonal skills and responsibility, and 5) analytical and communication skills (Maneerat et al., 2015).

The study reviewed the design of the integrated model after the first evaluation of students' experience and preparation for learning. The students' experience with the IRS-RBLO model which integrated research methodology and different online platforms such as Microsoft Teams, Line application, and Zoom were applied in the first trimester of the academic year 2022. The integrated design of the IRS-RBLO model included three phases: 1) design and plan learning activities covering 16 weeks, 2) teach and support learning which recruited 18 lecturers and 80 students, and 3) assessment and feedback.

The researchers hold the belief that the qualitative method offers distinct advantages in comprehending complex situations and leveraging data derived from students' reflective experiences. Consequently, the primary aim of this study was to investigate the pre- and post-immersion reflections of students who were enrolled in the integrated IRS-RBLO course. In light of this objective, the following research question has been formulated: What are the students' reflections regarding their experiences of active online learning in the IRS-RBLO model during the COVID-19 pandemic?

## 2. METHOD

This was a qualitative study that used the retrospective record review (RRR) (Buxton, 2018; CDC, 2018) through open-ended questionnaires to collect community public health students' learning reflections before and after the RBLO-integrated course. This study protocol was approved by the Human Research Ethics Committee of Walailak University (No. WU-EC-PU-1-339-64, November 2, 2021).

### 2.1 Data collection

A total of 80 undergraduate students who met the inclusion criteria to enroll in the RBLO-integrated course were recruited for the study. Data were collected from July 1, 2021, to September 14, 2021. The students' answers to the open-ended questionnaires before and after the RBLO class were collected via Google Forms. The questionnaires were divided into three parts. The face validity and content validity of the questionnaire, indicating that the questionnaire addresses the study objectives, were assessed by three senior research advisors (content validity index: CVI = 0.92). The first part consisted of five open-ended questions focusing on the pre-intervention experience: (1) What do you think are the problems of and obstacles to RBLO? (2) What do you think are the problem-solving methods in RBLO? (3) What kind of support do you need from your research advisor? (4) What kind of support do you need from the program? And 5) what kind of support do you need from the school or university? Part II had two open-ended questions focusing on their experiences after the RBLO class: 1) What type of skills you acquired the most after learning RBLO? and 2) what do you need to enhance your experiences of RBLO? Part III was a checklist of 20 research learning experiences before and after learning with RBLO class.

### 2.2 Data analysis

The study employed the thematic analysis method (Braun & Clarke, 2016) to analyze the collected data in five steps: 1) reading and rereading to understand the content, 2) identifying the codes, 3) creating categories or sub-themes by grouping similar codes, 4) developing and interpreting the themes based on their meaning and related phenomena, and 5) verifying the themes and report. In order to validate the reliability of the identified themes and categories, they underwent a thorough review process by a panel of 11 students. The researcher further conveyed the outcomes to a panel of experts, aiming to validate the reliability of both the conducted thematic analysis and the interpretation of the findings.

### 3. RESULTS

Out of the 80 participants, there were 74 females (92.5%) and 6 males (7.5%). The average age was 21.56 years ( $SD = 0.57$ ), with a range of 20 to 23 years. The average credit score was 157.61 ( $SD = 24.9$ ), and the average GPA was 3.02 ( $SD = 0.02$ ). All students consistently attended classes and followed the integrated research design, actively engaging in the learning process. Through thematic analysis, a variety of reflections from students regarding their experiences before and after the intervention were identified, as outlined below.

#### 3.1 Students' experiences before learning RBLO

##### 3.1.1 Problems of research-based learning online

Seventy-eight students answered the open-ended questions which resulted in five themes:

*Learning:* Thirty-seven students reflected *Stress and fear* on their perception of online learning. The result from the student feedback shows that a limited or insufficient grasp of the content led to the emergence of issues among the research group members and their research advisors. The online consultation was also a struggle, and the online class format was more stressful compared to the onsite counterparts. The students also experienced Wi-Fi or internet connection issues and a lack of data due to the pandemic. A student said, "... communication between the advisors and the students or members of the research group was difficult because there were problems with the internet signal combined with the complicated research content." (S<sub>56</sub>)

*Lack of teamwork affinity:* Twenty-four students were anxious about the affinity among the research group members due to difficulties in contacting their advisors via online platforms. The students' locations varied; some lived in their family homes while others lived on campus. Decreased communication between the students and the advisors also hindered the conduct of research, understanding of the research content, and reduced the clarity of the research advisors' answers. A student said, "... there should be better coordination and understanding with teachers for ease of conducting research." (S<sub>39</sub>)

*Fear of not having enough intellectual and computing skills:* Sixteen students reflected their concerns regarding lack of skills in conducting research and the fear of failing in research. In addition, online learning may cause unexpected obstacles such as dysfunctional research statistics programs, incorrect understanding of the research process, inability to select the right research topic and approached sample, problems with collecting and analyzing data, and those with writing references and research reports. A student said, "The tasks of choosing and approaching the target population cannot be shared with friends because it is online research. I am afraid that data collection will be more difficult than I thought." (S<sub>21</sub>)

*Anxiety because of insufficient research knowledge:* Ten students were concerned about knowledge of the research content because of the assumption that it was difficult to obtain. Therefore, it would be even more difficult in online learning. Moreover, understanding the research process took a considerable amount of time. The student said, "The obstacles that are expected are a matter of knowledge and understanding of research ... at the same time, there are no guidelines or examples for choosing information ..." (S<sub>18</sub>)

*Concern about reduction of learning enthusiasm:* Six students expressed concerns about their learning efficiency being undermined because they believed that learning through online media reduces enthusiasm. A student said, "I am afraid, I cannot perform to the teacher's expectation ... online learning can lead to misunderstandings ... The learners themselves may not be enthusiastic." (S<sub>17</sub>)

##### 3.1.2 Students' suggestions for learning solutions

Sixty-three students presented the following five solutions to their obstacles:

*Use multiple communication channels:* Twenty-four students proposed communication solutions by establishing a group on Line application to serve as a communication platform between the teachers and the students. In addition, question-and-answer activities were frequently performed throughout the period via the Microsoft Teams platform. One student said, "Provide guidelines for solving problems by doing online questionnaires and make understanding among group members through online group discussions." (S<sub>69</sub>)

*Go back to campus despite the risk:* Twenty-two students planned to travel back to their campus because of the availability of Wi-Fi service at their dormitories. This would also allow them to discuss the research project and help each other to conduct the study. They can work and verify their understanding of the work through easy communication and consult with their research advisors. One student said, "The students will go back to college even though classes are held online. But I am not sure if my research partner will come back to make communication easier." (S<sub>49</sub>)

*Set up a new online communication system:* Twenty students suggested establishing a clear communication system for the students and teachers by modifying their internet use. To understand and communicate the information in the same direction and adopt a data collection method that suits the situation, they would check the internet or Wi-Fi signal before starting the class, and review and read various research

articles as a guideline for learning. A student said, "Check your internet or Wi-Fi system before you start studying" (S<sub>55</sub>)

*Prepare research knowledge:* Twenty-two students proposed guidelines for creating accountability in their studies by planning the research. They would solve problems by reading more articles, increasing concentration, and reviewing each topic again after class. They consulted a research advisor or asked a lecturer in case of any doubt regarding the outline of the research proposal. A student said, "Read the accompanying book before class, listen carefully when the teacher teaches, and try to be mindful during the study as much as possible ..." (S<sub>69</sub>)

*Understand, adapt, and build relationships:* Twelve students suggested a solution to the learning problem by understanding the university's policy on offering 100% online learning amid the COVID-19 crisis. Moreover, students had to adapt to the changes in communication with classmates. In case of any confusion, they would immediately ask the lecturer for advice, exchange knowledge, and make effort to work together with the group members. A student said, "I was going to ask for research advice from a research advisor who gives advice honestly and politely." (S<sub>48</sub>)

### **3.1.3 Students' need for research advisors' help**

Eighty students who were seeking advisor support needed an online course that focused on cognitive learning outcomes. Regarding this, five themes emerged.

*Need research advisors' help:* Forty-six students needed their advisors to teach concepts so that they could visualize the research such as details on research methodology, sample size calculation, approaches to helping students gradually construct their understanding better, steps of research preparation, and comprehensive suggestions. One student said, "... I prefer that the advisors send us some research articles as a guideline for studying and scaffolding during each step of the research process." (S<sub>55</sub>)

*Pay attention, follow up, and be helpful:* Sixteen students required more support and advice to complete their research process, for example, research question conduction and outline research problems. In addition, they needed their advisors to simplify certain topics which were quite difficult for them.

A student said, "I want teachers who can give advice and fully help students. Since classes are held online, we cannot meet our advisors; there is a fear of having difficulty contacting them when we need counseling. Therefore, I would like an advisor to promptly respond to the student chats when we have questions or a lack of understanding in research." (S<sub>69</sub>)

*Consult all groups equally:* Nine students wanted to have the opportunity to choose an advisor to supervise their research. All groups needed equal and detailed explanations so that each could have the same level of understanding. All advisors had to communicate and understand while continuously monitoring the progress of the student's research. One student said, "Communication needs to be identical, meaning everyone should be on the same page about what the teacher communicated ... the information and conceived understanding are the same... because there are separate consultants, their understanding of the research may be different." (S<sub>35</sub>)

*Help point out specific topics:* Sixteen students needed advice and assistance from the research advisors because online learning excludes face-to-face meetings between them. They were concerned about having difficulty contacting their advisors when in need. One student said, "I need a research advisor to understand my fundamental concept of research ... equally follow up the work of all students, and have the same working style ..." (S<sub>59</sub>)

*Need support during online learning:* Four students wanted the teachers to understand the context of online learning in terms of unstable internet connection or inability to interact with the teachers. The need for home internet and phone bill spending was high. Furthermore, the equipment needed for the research, such as computers and notebooks, was not ready. A student said, "The biggest problem is an unstable internet signal. My house is not close to the main road; an internet connection is very costly. Therefore, I decided to switch from phone-delivered internet to home internet because it is relatively faster and cheaper." (S<sub>20</sub>)

### **3.1.4 Students' needs from the program**

Thirty students reflected on their needs from the Community Public Health program, which are categorized into four themes:

*Equipment and research budget:* Fourteen students needed the program to facilitate every aspect such as scholarships to support students and internet costs at home. The learning process was impeded due to inadequate equipment availability. One student said, "Equipment to be used for research is not ready, such as computers, notebooks, and the internet" (S<sub>80</sub>).

*Coordinate and extend the time to complete research:* Ten students needed the program to put the research subjects in the Community Public Health curriculum which could be applied in public health areas. They needed the program to coordinate with other departments regarding the research project and effective

communication. They were apprehensive about their ability to finalize their research within the semester; If feasible, they required an extension of the deadline. One student said, "If possible, I would like to extend the time for researching because I think I might not be able to catch up in just one semester." (S79)

*Provide the same suggestions to all students:* Eight students needed lecturers in the community public health program to provide the same guidelines, suggestions, and advice regarding the conduction of research. Suggestions for conducting research, from the research design to the verification of research reports for possible prompt revisions, were given to all in the same way. A student said, "It would be better if the program lecturer gives the same opinions and advice on various studies." (S32)

*Support for public health professional licensure test and graduation:* Three students expressed concerns regarding the public health professional licensure test and their graduation due to their lack of familiarity with the guidelines. They needed the program to arrange a meeting to explain what they had done and give early advice on the preparation for the professional licensure test and applying for work. A student said, "I would like to have a tutorial course for the professional licensure exam starting from this semester (1/2021) so that I will get more time to prepare and understand the guidelines." (S75)

### **3.1.5 Students' need to promote learning in the faculty/university**

Twenty-eight students reflected the necessity to promote learning in the faculty/university, which is categorized into two themes:

*Provide equipment support:* Fifteen students needed the School of Public Health to provide equipment support for online learning including conducting research, research budget, fee reduction, internet connection, and some equipment for the students who did not have a computer or notebook. One student said, "Equipment needed for the research is not ready, such as computers, notebooks, internet ... I need support." (S80)

*Awareness, encouragement, and recapping the content:* Fourteen students needed the School of Public Health to set the course according to the plan. Lecturers should participate, monitor, be aware, support students in searching for evidence-based statistics, and facilitate all matters related to the subject. A student said, "I want the teachers from the School of Public Health to help us when we need it." (S69)

## **3.2 Students' experiences after learning RBLO**

### **3.2.1 Good experiences**

Four themes emerged in this regard resulting from what they gained in the course.

*Made students accountable, patient, and punctual:* Forty-six students reflected a positive change in soft skills at the end of the course. For example, students took accountability for the assignments given and attended classes on time. They also learned to invest patience and commit themselves to hard work, report the research progress as scheduled, develop research content, and be able to carry out research successfully and on time. One student said, "I became more responsible and submitted the assignment on time as scheduled. I am able to work with my group, listen to group members, and understand the details of the research content better." (S6)

*Made students' strong-minded, persevering, and enthusiastic:* Twenty-two students reflected on improved behaviors after learning online. Students were more committed and responsible than ever before, interested in the content of the research lessons, and determined to produce the best assignment or research report every week. They invested more time in reading research articles than they had anticipated, and also with enthusiasm. Students learned and developed themselves continuously according to the goals of the subject. A student said, "There is the willingness to work and to make an effort to develop myself so that I can work according to the set goals on time." (S45)

*Work together as a group, share work, and help each other:* Seventeen students reflected on teamwork allowing a better group process. They specified the division of duties and collaboration with group members, listening to one another, participating within the group with good cooperation, and participating in joint consultations with the research advisors. They gained self-confidence from providing support to peers in work groups, good comments, participating in the classroom, taking action to solve problems, and working together to produce quality work, without delaying the research process. One student said, "I offered to assist my friends and support them in work groups. They also learned to be responsible for their duties, get the job done well, and it did not affect my accountability." (S59)

*An improved and intensive understanding of research:* Nine students reflected on their understanding of the research process and content including the introduction, literature review, methodology, results and discussion, and conclusions. They demonstrated skills in searching for data, writing the report, and using statistics; they also showed self-confidence in using a variety of software such as Microsoft Word, Endnote, and Microsoft Forms for research. One student said, "I have an understanding of public health research from the first chapter until the final one and know how to work together with my peers." (S64)

**3.2.2 Need increased learning experiences**

Four themes emerged in this regard indicating the need to increase experiences:

*Intention and hard work in learning:* Thirty-five students reflected on their need to improve research content, the steps of searching a database, reading research articles, reading before attending an online classroom, using a program regarding research, and writing up a research report. A student said, "... study hard, read research articles, and review literature related to the research's title." (S<sub>67</sub>)

*Time management and thorough details of research report:* Twenty-four students pointed out the aims of working to produce quality research based on time management, teamwork, planning and verification, and timely research report writing. A student said, "There are no details in the event yet; therefore, I will be more careful and check thoroughly before submitting the work ..." (S<sub>45</sub>)

*Self-confidence and assertive presentation:* Ten students reflected on their increasing confidence and assertiveness in answering questions in an online class. One student said, "It takes courage to speak in each lesson because I am not good at speaking; therefore, I need to improve more and more." (S<sub>15</sub>)

*Participation within the team and in an online classroom:* Six students reflected on improving work appointments with group members, and commenting or participating in an online classroom. One student said, "Leadership is not doing well, and it is not good enough for friends in the group; but, I tried my best in the past. I have always received encouragement and advice from my two friends ... I will improve." (S<sub>3</sub>)

**3.3 Students' research learning activities (RLAs) before and after learning RBLO**

The 20 RLAs of students' reflections showed 12 RLAs before learning (1st week), and covered 20 RLAs after completing learning (16th week). All RLAs increased after learning, but five were low in proportion accounting for less than 50%, as shown in Table 1.

**Table 1:** Students' Research Learning Activities (RLAs) Before and After Learning RBLO

No.	Research Learning Activities	n (%)	
		Before	After
1.	Answered questionnaires	72(90.0)	78(97.5)
2.	Read research articles	67(83.8)	77(96.3)
3.	Observed friends' conduction of research	66(82.5)	77(96.3)
4.	Learned research methodology	54(67.5)	71(88.7)
5.	Received lecturers' suggestions	31(38.8)	73(91.3)
6.	Helped in data collection	28(35)	61(76.3)
7.	Transferred research results to the practice of healthcare	9(11.3)	32(40.0)
8.	Helped with research utilization	23(28.7)	61(76.3)
9.	Helped the lecturer to conduct research	3(3.8)	12(15.0)
10.	Participated in a research meeting	1(1.3)	47(58.8)
11.	Participated in a conference	1(1.3)	21(26.3)
12.	Worked as a research assistant	1(1.3)	13(16.3)
13.	Transferred research results for learning	0	52(65.0)
14.	Collected research data	0	74(92.5)
15.	Coordinated research areas and the relevant persons	0	60(75.0)
16.	Practiced analyzing research data	0	70(87.5)
17.	Prepared documents for the human ethics committee	0	70(87.5)
18.	Learned research online	0	77(96.3)
19.	Worked with the research team online	0	77(96.3)
20.	Wrote a full research report	0	74(92.5)

Based on the findings, our study demonstrated a significant correlation between the pre-learning experiences of students and five key problem areas, as well as five suggested solutions. Furthermore, students expressed a need for support from their academic advisors with two, four, and five themes identified, respectively.

To address these findings, a design course called RBLO was developed, which incorporated the students' suggestions. After implementing this and evaluating the learning outcomes, four positive experiences were identified and four areas that require improvement in the students' learning experiences. Additionally, a notable increase of 20 research learning activities was observed (refer to Figure 1).



#### 4. DISCUSSION

The students' pre-learning experiences revealed their lack of preparedness in terms of knowledge, research advisors, research groups, online methods, and equal opportunities for learning compared to their peers. This underscored their need for support from relevant individuals. Prior to engaging in the learning activities, the findings indicated that students faced challenges such as "stress and fear of online difficulties," "potential decrease in team cohesion," "inadequate intellectual skills for research conduct, causing concern," and "anxiety arising from insufficient research knowledge." These findings imply that students experience anxiety in their learning process, which is unrelated to the COVID-19 infection as all students were studying from home. This aligns with the research conducted by Arribathi et al. (2021), which also highlighted student anxiety in both regular and non-regular student groups.

Among the students, the most significant concerns were the lack of social interaction, inadequate home office infrastructure including limited data bandwidth, and an overall decrease in motivation and effort (Worapun, 2021). Notably, six students expressed apprehension regarding themselves and their research advisors. This highlights the importance of students' reflections on their research advisors, who possess varying levels of teaching experience. Consistently, the students perceived disadvantages, particularly with regard to staff availability, and they did not believe that the research staff's needs should take precedence over their own needs (Healey et al., 2010).

Nonetheless, students required comprehensive support from their research advisors, faculty members, and academic institutions in various areas, including effective communication and meaningful discussions by lecturers regarding pertinent issues (Kenworthy & Kielstra, 2015). This form of support is intricately connected to the requirement for students to receive guidance from their research advisors, thereby facilitating their learning journey. This encompasses providing focused attention, diligent follow-up, comprehensive assistance, and equitable consultation for all student groups. Additionally, research advisors should help identify specific topics and offer support during online sessions. The significance of these factors has been accentuated by the feedback received from thirty students. They emphasized the imperative need for sufficient resources and research funding, enhanced coordination, extended research completion timeframes, equitable dissemination of suggestions to all students, and comprehensive support in preparing for professional licensure exams and graduation in the field of public health. These findings align with the work of Fernández Álvarez and Montes (2021), which emphasized the importance of establishing contact with students prior to the commencement of the course, conducting introductory activities involving all participants, fostering various opportunities for interaction, and encouraging the sharing of information and experiences. However, it is worth noting that only 28 students expressed a clear perception of the tangible benefits derived from engaging in research activities at universities and the extent of their involvement with academic research (Jusoh & Abidin, 2012).

The RBLO course was designed and implemented based on valuable input from students, incorporating their suggestions on various themes such as "utilizing multiple communication channels," "returning to campus despite the associated risks," "establishing a new online communication system," "enhancing research knowledge," and "understanding, adapting, and building relationships." These themes align with the findings of a qualitative study conducted by Tay et al. (2021), which aimed to capture the considerations and perspectives of eight mathematics teachers in designing online home-based learning lessons for elementary and secondary students.

To accommodate the limited duration of each session (25 minutes) for active learning content, including a 10-minute break and a recap of previous discussions, video demonstrations were not included in the integrated subject design. However, this approach proved suitable for the students' specific context as examined in the study.

Upon completion of the course, students reflected on four positive themes, which differed from the five themes highlighting challenges encountered with RBLO. These reflections can be viewed within the context of the integrated subject design in RBLO, adhering to the standards set by UKPSF (*UKPSF Dimensions of the Framework*, 2020), TQF of HEd (Khamchan et al., 2022), and the 14 best practices for teaching online (*Research-based effective online teaching strategies*, 2020).

The research reports submitted by 27 students showcased their critical thinking skills, a crucial attribute in the 21st century. These skills involve evaluating the value of claims or information and reaching conclusions on how to respond. This demonstrated the students' ability to develop proposals, collect data, and analyze, evaluate, and interpret research findings, highlighting their intellectual and emotional growth throughout the process (Lamb et al., 2017; Susiani et al., 2019).

Furthermore, the students developed adaptability in the realm of online learning and recognized its strengths. Mather and Sarkans (2018) supported this notion, emphasizing that factors such as flexibility,

accessibility, the ability to balance personal, professional, and academic life, and the desire to explore novel learning approaches influenced students' decisions.

The study's outcomes can contribute to the ongoing discussion of specific strategies aimed at strengthening the connection between teaching and research, ultimately enhancing the undergraduate learning experience (Jusoh & Abidin, 2012).

Based on students' perceptions, their understanding of research nature and the development of research skills significantly increased through active engagement in research activities. The students recognized the potential employment benefits derived from participating in such activities. In the context of this study, numerous students acknowledged the advantages of being instructed by research personnel who demonstrated enthusiasm, enhanced credibility, and the prestige associated with being taught by renowned researchers (Healey et al., 2010). The students exhibited effective collaboration within digital groups, although they expressed a preference for smaller groups comprising familiar members rather than random assignments. The consensus among most students was that the integration of pre-recorded and streamed lectures, frequent virtual meetings, and interactive student response systems holds the potential to significantly amplify learning outcomes in forthcoming digital courses. The students' preference for written home exams over online versions of previous on-campus exams likely stemmed from their familiarity with the former (Almendingen et al., 2021). Improvement themes emphasized the essential skills demanded by organizations in the future, including problem-solving, teamwork, communication, and critical thinking (Kenworthy & Kielstra, 2015). These findings align with a study on students' awareness, experiences, and perceptions of the teaching-research nexus, which revealed a moderate level of student awareness regarding their lecturers' research activities (Jusoh & Abidin, 2012).

While students expressed a desire to expand their experiences, their reflections highlighted the inadequacy of the educational system in providing sufficient skills (Kenworthy & Kielstra, 2015). The students acknowledged the need for increased effort and commitment to learning, considering the emotional barriers that needed careful management. Working online often led to distractions, with students spending up to 60% of their time on non-subject-related materials. The role of the subject instructor and content delivery played crucial roles in mitigating these issues. Additionally, other considerations, such as breaking information into content blocks, should be considered. The integration of research books in the curriculum supported all students and aligned with studies on student engagement in the online classroom (Fernández Álvarez & Montes, 2021). Students are required to enhance their time management skills, meticulously attend to the details of research reports, cultivate self-confidence, adeptly deliver assertive presentations, and engage actively in both team projects and online classes. The success of online education relies on students' motivation, sustained interest in the course content, and engagement with their peers (Fernández Álvarez & Montes, 2021). Notably, students recognized that their understanding of research nature and the development of research skills improved significantly when actively involved in research methodology and projects (Healey et al., 2010).

The completion of 20 reflective learning exercises after the learning process demonstrated the successful implementation of the RBLO-integrated class, leading to enhanced content retention, improved attitudes toward learning, and other benefits. One of the primary objectives of university education is to cultivate students' academic thinking abilities (Singh, 2014), and the concept of RBL serves as the fundamental basis of knowledge derived from research (Fernández Álvarez & Montes, 2021).

The COVID-19 pandemic has inadvertently spurred healthcare innovation and fostered collaboration across various disciplines aimed at saving lives. The study encouraged students to design their learning timeline, monitor their progress, and provide regular feedback. As a result, students gained valuable experiences, which aligns with the findings of an experimental study that observed a significant difference in students' learning achievements before and after the learning process (Worapun, 2021). The success of RBLO relies on students' sustained motivation and interest in the integrated research subject, as well as a supportive online classroom environment that encompasses the content of the research methodology course, student perspectives on engagement, and an engaging classroom atmosphere (Fernández Álvarez & Montes, 2021).

## 5. LIMITATION

The scope of this study encompassed students' experiences within specific contexts, utilizing a retrospective record review derived from open-ended questionnaires. The study exclusively centered on capturing students' reflections on their learning experiences both before and after participating in context-specific courses. Subsequently, the learning design was aligned with the particular context, considering various associated factors. The execution and application of this design warrant significant attention.

## 6. CONCLUSIONS

The students' experiences highlighted their pre-intervention and post-intervention learning encounters derived from the RBLO-integrated class conducted over a duration of 16 weeks. The themes that encompassed their experiences, including the identification of problems, provision of suggestions, and expression of their learning needs before the intervention, carry significant importance in the process of designing a course centered around the COVID-19 crisis. This is in alignment with the standards set by the UK Professional Standards Framework (UKPSF) and the Tertiary Quality Framework for Higher Education (TQF: HEd).

All stakeholders involved in the learning process should collaborate to develop learning activities that address the students' challenges, suggestions, and needs. Additionally, it is crucial to consider factors related to the research advisors and the program at the university's School of Public Health. Moreover, the university and the school's policies concerning the quality of education play a pivotal role in guiding lecturers involved in the program when designing online courses.

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