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Instructional strategies development with the research-based learning management model to enhance research skills and systems thinking skills for physical education students at the Thailand National Sports University Lampang Campus

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Abstract

Creative the instructional strategies development with the 12 research-based learning management (RBLM) lesson plans to model for enhancing research skills and systems thinking skills of 44 junior physical education students at the Thailand National Sports University, Lampang Campus. They enrolled in a preliminary research methodology class administered. Students' perceptions of actual and preferred forms with the 35-item *Research-Based Learning Management Questionnaire* (RBLMQ), their research skills were measured with the 32-item *Research Skills Measurement* (RSM), and the system thinking skills with the 28-item *System Thinking Skills Measurement* (STSM), and satisfactions of their RBLM model with the 35-item *Satisfaction of Learner Interaction Questionnaire* (SLIQ) were described. Associations between actual students' perceptions of their RBLMQ and their RSM, STSM, and SLIQ were investigated. The RBLMQ, RSM, STSM, and SLIQ instruments are valid and reliable. The 12 RBLM innovative lesson plans are efficiency quality and appropriateness level with the IOC by the 5-professional educators was checked. The actual and preferred RBLMQ, RSM, STSM, and SLIQ of their perceptions for each scale are differentiated significantly at .05 by t-test analysis. These affecting sizes on all these instruments are the *Medium Effect Size* by the ANOVA (eta^2) analyzed. In most cases, students would prefer more actual mean scores were compared. Appropriate statistical procedures were used; the simple correlations (r) are positive direction, and the β-regression weights are able to be predicted the correlations between the independent variable (RBLMQ scales) and dependent variables (RSM, STSM, and SLIQ totalized means). The multiple correlations (R) values indicate of a higher standardized R at 0.7. The R^2 values indicate that 60%, 63%, and 68% of the variances in *Research Skills*, *System Thinking Skills*, and *Students' Satisfaction* to their preliminary research methodology class were attributable, respectively to their perceptions of the research-based learning management model was developed and satisfied significant, relatively.

Keywords: Actual and preferred forms, undergraduate student,the research-based learning managementmodel, research skills, systems thinking skills, means were comparisons, variables were associations

INTRODUCTION

Thailand National Sports University (TNSU) is a public higher education institution under the Ministry of Tourism and Sports, formerly known as the Institute of Physical Education acting as a teacher especially physical education and health education teachers. Currently, the TNSU has increased its role in producing professional personnel in sports science and increased health. The university consists of six regional campuses in Thailand, which are divided into 17 campuses, each of which is managed by a faculties system and bachelor's degree programs (Thailand Government Gazette, 2019)[1].Physical Education Bachelor of Education Program, Faculty of Education, the TNSU operates a four-year bachelor's degree curriculum instructional management consisting of 2 subject programs: physical education program, and physical education programs for people with disabilities. Focused on the assessment of problems and needs for the development of research-based learning management (RBLM) model to enhance research skills and systemic thinking skills for physical education students at the TNSU Lampang Campus was integrated. Using the RBLM model was designed learning management to develop learning in the 21st century for physical education students of their problems and needs in developing a research-based learning management model to enhance research skills and systems thinking skills were assessed and satisfied (Thailand National Sports University, Lampang Campus, 2019)[2].

What is research-based learning?

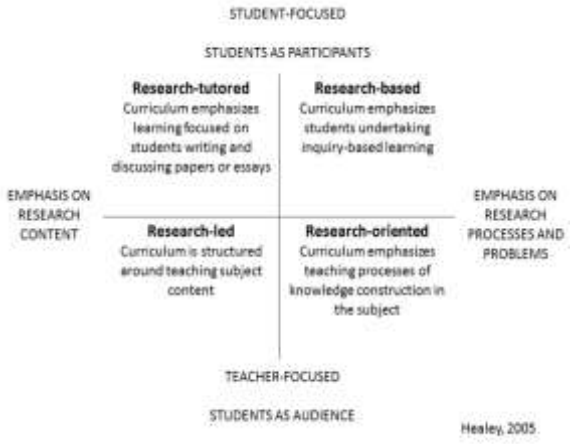
With the changing times, higher education is going through a paradigm shift, moving away from traditional lecture-bound learning to student-centric education. More and more institutions of higher learning have realized the importance of research-based learning (RBL). It is the integration of the theoretical knowledge base or theoretical knowledge with the use of appropriate data collection and analysis procedures to examine verify or study a phenomenon or occurrence. Activities of practicing inquiry and research are needed to develop the research competencies of future professionals. Students should be involved in a learning process where the theory and practice emerged and interconnect with each other. Students also need theoretically oriented method courses and need to work on skills like observation, interview, and interpretation. The RBL's teaching implies that students carry out research in their courses independently and with an open outcome. The intention of research-based learning is that university academics make positive moves to help students build strong intellectual and practical connections between research frontiers and the student's own learning. The RBL helps to internalize and practice research conducts and methods, skills such as formulating a precise question and processing and monitoring a research process. Students attain abilities in dealing with uncertainty, independence, teamwork, and organizational skills (Arora, Saxena, &Gangwar, 2017)[3].

In research-based learning management, students actively search for and then use multiple resources, materials, and texts in order to explore important, relevant, and interesting questions and challenges. They learn how to solve problems, challenges, and dilemmas. Finally, they develop communication skills through writing and discussion. Research-based learning (RBL) consists of a framework that helps to prepare students to be lifelong inquirers and learners. It is specific management of classroom teaching that places less emphasis on teacher-centered learning of content and facts and greater emphasis on students as active researchers. The framework of research-based learning: In order to face new challenges, university programs have to adapt their study programs and methods in order to develop student's research competencies, especially those related to conducting research projects, and also to be able to transfer their knowledge and academic experiences to their professional teaching practice. For this proposal, the paradigm of "research-based education" seems to be one of the most adequate to be implemented in the university's study proposals (Seif, 2021)[4].

Research-based learning is a multi-faceted concept referring to a variety of learning and teaching strategies that link research and teaching. A good framework of research-based learning may include: Setting research outcomes that cover the curriculum: extensive and Judicious use of

research-process-based methods of teaching and learning; imparting training through workshops/ tutorials to students for using the research tools• Developing an inclusive research context (Blackmore & Fraser, 2007)[5].This classification was used by Healey (2005)[6] to develop a matrix showing the link between curriculum design, research and teaching. Healey suggests that only few curricula fit in one quadrant, but that most traditional university teaching takes place in the bottom left quadrant of research-led teaching. To his opinion higher education should place more emphasis on research-tutored or research-based pedagogies, as these managements have the most benefit for student learning. Furthermore, by performing undergraduate research students are becoming more confident to do pharmaceutical research and gain more interest in the discipline that as shown in Figure 1(a) (Healey, 2005)[6].

Strategies for incorporating the RBL into curriculum, following strategies provide general guidelines for incorporating the RBL into courses and programs. Robert Marzano (2001)[7] conducted a meta-analyses of education research on teaching strategies to see which strategies seemed most related to student academic achievement—at all levels and across all subjects that including interesting ideas: Comparing, contrasting, classifying, analogies, and metaphors; summarizing and note-taking; reinforcing effort and giving praise; homework and practice; nonlinguistic representation; cooperative learning; setting objectives and providing feedback; generating and testing hypotheses. He believes that teachers need to choose areas of improvement throughout the year and administrators should be responsible for providing opportunities to observe effective strategies of other teachers. Administrators should then provide feedback and dialogue to teachers about how they can become more successful.



a) A matrix showing the link between curriculum design, research and teaching

b) Marzano's 9 instructional strategies infographic form

Figure 1: Research-based instructional strategies framework that link between curriculum design, research and teaching by Healey, and instructional info-graphic form for learning and teaching design by Marzano

Source: a) Healey (2005)[6]

b) Marzano (2001)[7]

Marzano's 9 Instructional Strategies Infographic can help teachers stay focused and provided learning practices students need as shown in Figure 1(b) (Marzano, 2001)[7].The nine strategies

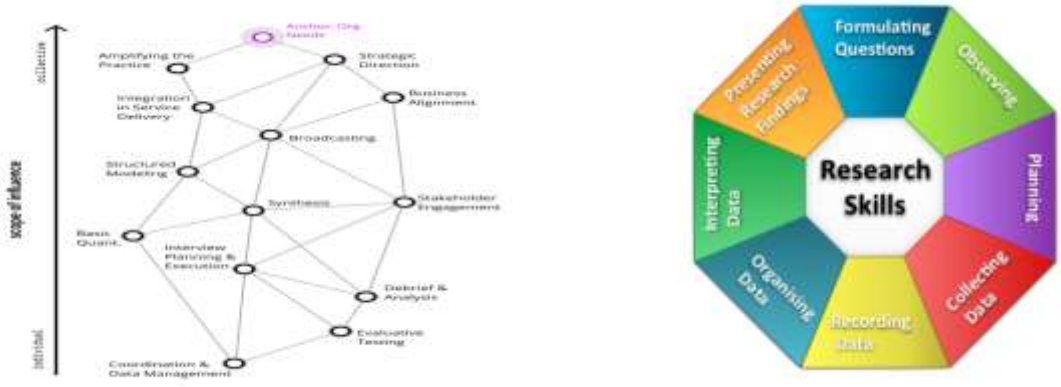
discussed in the book can be grouped into three components of instruction (Figure 1(b). How do teachers use research-based knowledge? To apply this principle, consider the following teaching techniques: Check students' understanding of the task; have students guide self-assessments; require students to reflect on and annotate their own work; prompt students to analyze the effectiveness of their study skills; and have students engage in peer feedback (Marzano, 2003)[8].Marzano's 9 instructional strategies for learning include: Identifying similarities and differences; summarizing and note-taking; reinforcing effort and providing recognition; homework and practice; non-linguistic representations; cooperative learning; setting objectives and providing feedback; generating and testing hypotheses; and cues, questions, and advance organizers (Tyson, n.d.)[9].

The Teacher's Role: A teacher provides a climate that supports student curiosity and questioning. Teachers enable students to ask questions and pose problems. Students are invited to ask and answer questions. The classroom climate is conducive to using higher-order thinking and problem-solving skills to apply knowledge to solve problems. Teachers attempt to build ways for students to take ownership of their learning, to create a value and a purpose for learning. In a research-based learning classroom, teachers often act more like a coach, guiding students as they develop questions and problems, helping students to find, read, sort, and evaluate information, allowing students to draw their own conclusions, and providing the time and the opportunity for students to communicate results (Keiler, 2018)[10].

Student outcomes of their best practice strategies' development of the RBLmanagement model, significantly. Thinking skills are developed as students classify, organize, and synthesize information (Ariratana, 2010)[11]. Teachers who provide a structure for research-based learning as part of their regular teaching routine should experience greater interest and involvement on the part of their students, and help students develop both skills and a fundamental knowledge base that are important for a lifetime of learning (Seif, 2021)[4]. In addition, students feel greater ownership for their learning and the learning process and thus develop greater self-esteem with regard to learning. There is greater interest in and curiosity about learning and a willingness to work harder to learn. Students are more likely to retain information longer because it is more meaningful to them and organized in a more interesting learning (Bolt-Lee, 2021)[12].

What are the research skills?

Research skills refer to the ability to search for, locate, extract, organize, evaluate and use or present information that is relevant to a particular topic. Academic research is a specific type of research: a process of detailed and methodical investigation into some area of study.It involves intensive search, investigation, and critical analysis, usually in response to a specific research question or hypothesis. It also usually involves a lot of reading (Glassdoor Team, 2021)[13].Research skills are the ability to find an answer to a question or a solution to a problem. They include your ability to gather information about a topic, review that information and analyze and interpret the details in a way to support a solution. Having research skills is necessary to advance your career as they directly relate to your ability to gain insight and inspire action in both yourself and others (Ariella, 2022)[14].Research skills refer to a collection of several separate skills that help you find and review the information and arrive at a decision. Research skills in the workplaceincludesearching for information,attention to detail,taking notes, time management: problem-solving, and communicating results (Indeed Editorial Team, 2020)[15].



a) Research skills framework *b) Research skills model*

Figure 2: Research Skills Framework and research skills model

Sources: a) ResearchOps Community (2019)[16].

b) Effectiveness Skills Framework (ESF) Information Literacy (2019)[17]

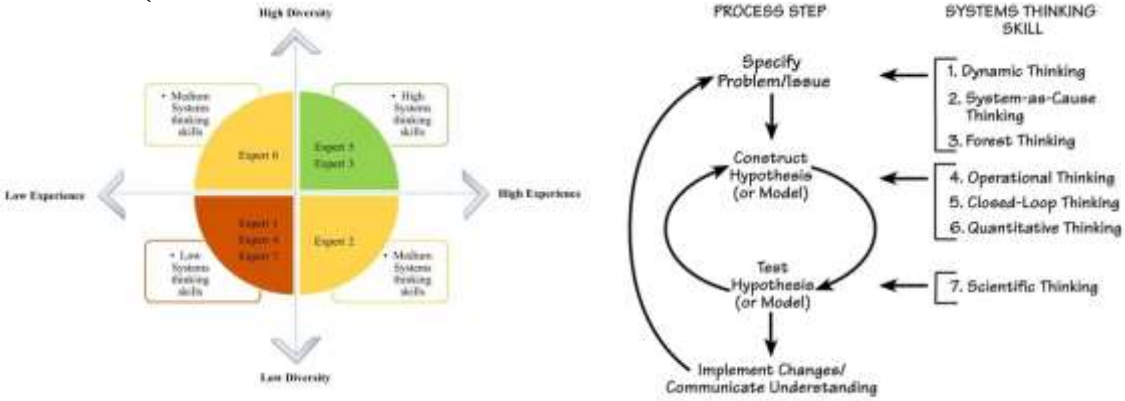
As reported in Figure 2(a) is the *Research Skills Framework* (RSF). "RSF" is a pattern language for research practice, with a set of tools for researchers and their teams to learn, work, and grow. We are learning together as a community how to build these practices into our teams, and continually contributing back to the framework: Learn the skills & practices; build researcher and students' projects & playbooks; map progress & goals; and new frontiers & exploration (ResearchOps Community (2019)[16]. Figure 2(b) shows the research skills modelthat includes: formulating questions, observing, planning, collecting data, recording data, organizing data, interpreting data, and presenting research (Effectiveness Skills Framework (ESF) Information Literacy (2019)[17].

Why are research skills important? Research skills are a vital part of the writing process because they enable writers to find information and create an outline for their writing project—whether it's creative or academic writing. By developing organized and effective research methods, you'll be able to become knowledgeable in any field that you need to write about (Berba& Oliva, 2022)[18]. Research Skills enable people to identify a problem; collect informational resources that can help address the problem evaluate these resources for quality and relevance and come up with an effective solution to the problem (Brown, (2021)[19].

How to develop research skills? There are 5 ways to improve your research skills: Learn the art of searching and plan your search strategy; trace citations to unlock the scholarly conversation on your topic over time, explore expert help guides related to your research, and systematically record and manage your references, and meet with your senior library learning advisor (Edwards, 2021)[20]]. The ideas for strengthening research skills include: Practicing research questioning strategies; practicing critical reading strategies; practicing close reading skills; practicing the development of thesis statements; practicing evaluating internet sources; practicing observation skills and using inductive and deductive reasoning within a classroom model of action research; practicing pure vs. applied research; and encouraging pre-planning of a senior thesis or project (Booth, Colcomb, & Williams, 2003)[21]. However, some key research skills include the ability to understand and integrate resources gleaned through various means in archives, via interviews, etc. the ability to survey and understand 'fields' of knowledge. The ability to collect and organize important historical data is integrated (Indeed Editorial Team, 2020)[15].

What are the systems thinking skills?

Systems thinking is a way of making sense of the complexity of the world by looking at it in terms of wholes and relationships rather than by splitting it down into its parts (Ramage & Shipp, 2009)[22]. It has been used as a way of exploring and developing effective action in complex contexts. Systems thinking draws on and contributes to systems theory and the system sciences that systems theory is the interdisciplinary study of systems, i.e. cohesive groups of interrelated, interdependent components that can be natural or human-made (Government Office for Science, United Kingdom, 2012)[23]. The goals of systems theory are to model a system's dynamics, constraints, conditions, and relations; and to elucidate principles (such as purpose, measure, methods, and tools) that can be discerned and applied to other systems at every level of nesting, and in a wide range of fields for achieving optimized equifinality (Beven, (2006)[24]. System Thinking Skills can be learned (Figure 3(a) (Mitra, 2018)[25]. The systems thinking method comprises four steps. The seven systems thinking skills come into play during this method as shown in Figure 3(b) (Richmond, n.d.)[26].



a) Systems thinking model based on experience and diversity in research-based learning areas

b) The "thinking" in systems thinking: Honing your skills.

Figure 3: Systems thinking skill model

Source: a) Ritayan Mitra (2018)[25]

b) Barry Richmond (n.d.)[26]

As the researchers, we are the instructors in the Faculty of Education. Therefore, he is interested in developing a research-based learning management model to enhance research and systemic thinking skills for students in the field of Physical Education, at Thailand National Sports University Lampang Campus as a guideline to improve learning management that develops students' systematic thinking process and research skills to be more suitable and effective for the best practice instructional strategies' development with the research-based learning management model for students actively search for and then use multiple resources, materials, and texts in order to explore important, relevant, and interesting questions and challenges. They would be found, processed, organized and evaluated information and ideas as their building reading skills and vocabulary on research.

METHODOLOGY

Designing the instructional strategies development in the classroom learning environment quantitative research assessed the junior physical education students at Thailand National Sports University, Lampang Campus to the Research-Based Learning Management (RBLM) Model to apply this principle, consider

the following instructional techniques, to prompt students to analyze the effectiveness of their study skills. Students have access to resources on campus that are essential for high-quality research-based learning. Active engagement with research provides a more enjoyable and stimulating university experience developed with their perceptions' responses to the research instruments.

Research purposes

1. To integrate the problems and needs in developing a research-based learning management model to enhance research skills and systems thinking skills for junior physical education studentsat Thailand National Sports University, Lampang Campus.
2. To administer the instructional strategies development with a research-based learning management model for enhancing students' research skills and systems thinking skills for junior physical education students.
3. To assess students' perceptions of their responses to the instructional strategies development with the research-based learning management model for junior physical education students.
4. To improve a wide set of research-related skills and is a recommended learning experience for junior physical education students is regarded by the Research-Based Learning (RBL).

Research procedures

Step I: Instructional strategies development with the research-based learning management model was detailed

Subject course: Preliminary Research Methodology 3(2-2-5)

Course syllabus: Concepts; principles; theories; research methodology; the research topic; defining the problem; review of relevant documents; conduct research; tools to gather information; data analysis and interpretation; writing research reports; evaluation of research.

Number of hours per week that instructors provide individualized academic mentoring and guidance to students: In-class and out-of-class guidance If students have questions about the content of their studies, they can inquire during office hours of 10 hours per week (5 days, 2 hours a day) or make an appointment in advance if they want to consult outside of office hours. No information.

Step II: Classroom learning environment on innovative lesson plan was invented

With the ensuing enthusiasm for learning environment research, studies began to emerge in countries such as Australia, The USA, The UK, Canada, Japan, Malaysia, Singapore, Korea, Taiwan, Thailand, and Indonesia, some of which can be regarded as pioneers in the field. Those studies focused on students' perceptions of classroom learning environmental classes. Overall, much progress has been achieved in the conceptualization, assessment, and investigations of the classroom learning environment in the three last decades are illustrated in Chanthala, Santiboon & Ponkham, 2018[27]; Fraser, 1994[28]; Goh & Khine's, 2002[29], Khuana, Khuana & Santiboon, 2017[30]; Santiboon, 2012[31], 2016[32]], 2017[33]; Santiboon & Fisher, 2005[34].

The 12-Research-Based Learning Management (RBLM) Model Innovative Lesson Plans of the essentials were built on how to begin the RBLM integration journey with five guiding principles for effective RBLM instruction, *Preliminary Research Methodology* classroom environments were responded to what these principles look like in action of junior physical education students' perceptions, sample activities that put all RBLM Model Innovative Lesson Plans in 15 weeks' fields into practice, and lesson planning templates for the RBLM Model units were assessed by the professional expert educators were checked off their efficiency quality to the innovative lesson plans according to the RBLM Model are systematized and organized the details of an idea in a head and carry it out were built. Associated divergent thinking with research skills and systems thinking skills of their responses to the RBLM Model for physical education students were integrated.

Step III: Creating research instruments

*How did we create the research instruments?*In the process of developing the research instruments and the questionnaires as a part of research the research-based learning management model

project was created. The students' approaches to learning and their experiences of research skills and systems thinking skills to their Instructional strategies development with the research-based learning management model toward preliminary research methodology course at the university. For example A questionnaire on conditions, problems, and needs for developing the research-based learning management model to enhance research skills and systemic thinking skills; The learning management lesson plans with the research-based learning management model to enhance research skills and systems thinking skills; Research skills measurement; System thinking skills measurement; and questionnaire on the satisfaction of learners towards learning according to the research-based learning management model.

Step IV: Actual and preferred assessment forms by students' perceptions

An investigation of differences between students in their perceptions of the same actual classroom environment and of differences between the actual environment and that preferred by students was reported by Fisher and Fraser (1983a)[35] for the comparisons of student actual with student preferred scores. In addition to a form that measures the students' perceptions of their *actual* classroom environment, there is another form that measures the *students' preferred* classroom environment. The preferred forms measure the student's perceptions of the classroom learning environment that they would ideally prefer. Although the wording of items is similar for actual and preferred forms, different instructions for answering each are used. For example, *"I know how to research is extremely important today"*in the actual form is changed to *"I would know how to research is extremely important today"*in the preferred form Fraser, 1982b)[36].

Generally, students' perceptions of their preferred more positive learning environment are the ones where learners feel involved and responsible for their learning while being comfortable enough to fully participate in group and individual activities (Santiboon, 2013)[37]. This research procedure assessed the relationship between junior physical education perceptions of their actual classroom environment varies in the *Preliminary Research Methodology* class. The Actual Assessment Form assessed students' perceptions of their research instruments in the 10^{th} – 13^{th} week and the Preferred Assessment Form was assessed in the 1^{st} week.

Step V: Associations between student outcomes and environment

The strongest tradition in past classroom environment research has involved the investigation of associations between students' cognitive and affective learning outcomes and their perceptions of psychosocial characteristics of their *Preliminary Research Methodology* classroom have been replicated for a variety of cognitive and affective outcome measures, a variety of classroom environment instruments and a variety of the instructional strategies development with the research-based learning management model for enhancing the sample of approximately 44 junior physical education students of their research skills and systems thinking skills were assessed.

Step VI: Draw a circle around

These questionnaires contain scales about practices which could take place in this class. Students will be asked how agree with each practice takes place in the *Preliminary Research Methodology* class. There are no 'right' or 'wrong' answers. Student's perception is what is wanted. Think about how well each item on each scale describes what this class is like for student's responses and interpretation with means average scores for each scale of the research instruments.

Table 1: Interpretational levels for indicating students' perceptions of their responses according to the research instruments

Scoring option	Practice takes place of students' perceptions	Interpretation level	Means scoring interpretation level

1	if the practice takes place	Strongly Disagree	Means ranged from 1.00 to 1.80
2	if the practice takes place	Disagree	Means ranged from 1.81 to 2.60
3	if the practice takes place	Uncertain or Not Sure	Means ranged from 2.61 to 3.40
4	if the practice takes place	Agree	Means ranged from 3.41 to 4.20
5	if the practice takes place	Strongly Agree	Means ranged from 4.21 to 5.00

Research instruments

Although research and evaluation in physical education have relied heavily on the assessment of academic achievement and other valued learning outcomes, these measures cannot give a complete picture of the educational process. Classroom environment instruments can be used as a source of process criteria in the evaluation of educational innovations.The creating research describes the following important and contemporary instruments in this research project, which involve the extent to which the environment is orderly, clear in expectations, maintains control, and responsive to change.

***Research-Based Learning Management Questionnaire* (RBLMQ)**

Adapted and modified the research-based instructional strategies framework that links curriculum design, research, and teaching by Healey (2005)[6], and instructional info-graphic form for learning and teaching design by Marzano (2003)[8], the new taxonomy (Marzano & Kendall 2007)[38], and research-based learning: a lifelong learning necessity that is the idea of Elliott Seif (2021)[4] to the *Research-Based Learning Management Questionnaire* (RBLMQ) of this research involving perceptual measures of a variety of in the seven stages of research-based learning for junior physical students. The RBLMQ includes 7 scales, each scale consists of 5 items, and the final version contains a total of 35 items in seven scales, namely: Conditional Make Sense (CMS), Student Problems/Needs (SPN), Identify/Clarify Issue (ICI), Find/ Process Information (FPI), Think Research/Systemic Skills (TRSS), Apply Knowledge/Ideas Conclusion (AKIC), and Students Communicate Result (SCR).

Research-Based Learning Innovative Lesson Plan (RBLILP)

The *12-Research-Based Learning Innovative Lesson Plan* (RBLILP) includes the opportunity for students to generate new ideas and present them back to the group. By the end of the activity students will be able to: Explore and generate ideas. Reflect on where they see innovation being used and how it links to creativity on the *Preliminary Research Methodology* course in 3 hours per week. The final instructional strategies development contains a total of 15 weeks.

***Research Skills Measurement* (RSM)**

Creative the research instrument to the 32-item *Research Skills Measurement* (RSM) is an integral component of the junior students in the physical education program of their information literacy/research skills appropriate about a variety of available sources that produce creative students who have an appreciation of literature, critical thinking skills, technology skills and a respect for others and self of reliable research skills. The RSM helps them to find answers to questions. This is because research skills are the ability to search for, find, collect, analyze, interpret and evaluate information that is relevant to the subject being studied by Research Skills Framework and research skills model (ResearchOps Community, 2019[16] and Effectiveness Skills Framework (ESF) Information Literacy, 2019[17] on nine RSM steps, such as *Formulating Questions, Observing, Planning, Collecting Data, Recording Data, Organizing Data, Interpreting Data*, and *Presenting Research* steps. The RSM includes 8 scales in five options; each scale consists of 4 items and totalized 32 items.

***System Thinking Skills Measurement* (STSM)**

Modified the 28-item*System Thinking Skills Measurement* (STSM) from the Systems thinking skill model of Ritayan Mitra (2018)[25] and Barry Richmond (n.d.)[26] that systems thinking offer a way to formulate and solve such problems more effectively. The STSM includes seven systems thinking skills that come into play during this method shown: *Dynamic Thinking, System-as-Course Thinking, Forest Thinking, Operational thinking, Closed-Loop Thinking, Quantitative Thinking, and Scientific Thinking.* The RSM includes 7 scales in five options; each scale consists of 4 items and totalized 28 items.

Satisfaction of Learner Interaction Questionnaire (SLIQ)

Not only does it improve performance, it also promotes our physical education student population's mental health and stability, which are conducive to both short-term learning goals and long-term character building and social inclusion. The following are suggestions by Rob Kelly (2009)[39] to the 35-item *Satisfaction of Learner Interaction Questionnaire* (SLIQ) for improving student satisfaction:*Post the course syllabus on the Research-Based Learning Management Model (RBLMM), Administer a Learning-Styles Inventory (ALSI), Explain the Importance of Group Work (EIGW), Use Team Contracts (UTC), Use a Variety of Assessments (UVA), Be flexible (BeF),* and*Provide Frequent Interaction (PFI)* scales.The RSM includes 7 scales in five options; each scale consists of 5 items and totalized 35 items.

Most of the questionnaires: the 7-scale RBLMQ, the 8-scale RSM, the 7-scale STSM, and the 7-scale SLIQ research instruments were assessed by actual and preferred students' perceptions. Each scale using the five response alternatives of Strongly Disagree, Disagree, Uncertain, Agree, and Strongly Agree levels are interpreted.

Sample size

The sample group consisted of the 44 junior physical education students in the Department of Physical Education., Faculty of Education, Thailand National Sports University Lampang Campus, in the first semester, of the academic year 2022 were obtained by Cluster Random Sampling who enrolled in the Preliminary Research Methodology course was administered.

Data analysis

Classifying followers' groups by number of 44 junior physical education students who are able to the presenting information with the 35-item RBLMQ, the 32-item RSM, the 28-item System Thinking STSM, and the 35-item SLIQ) were analyzed, compared, and associated. Statistically significant were analyzed with the foundational and inference statistics, such as; Internal Consistency (Cronbach alpha reliability) efficiency (Cronbach, 1951)[40], Item and scale means, Item standard deviation, Item variance, t-test, ANOVA (eta^2), Simple and Multiple Correlations (Pearson, 2008)[41], Standardized Regression Weight Validity (β), and Coefficient Determinant Predictive Value (R^2) were predicted.

Data correction

Validities of the research instruments

Using the *Internal Consistency (Cronbach alpha reliability) efficiency*: The authors used the Cronbach alpha coefficient as a measure of "the internal consistency of the four-six scales". They report that "the Cronbach alpha reliability coefficient for each scale, using an individual student as the unit of analysis, ranged between 0.87 and 0.60" which they considered "generally satisfactory" for the validity of the research instruments for each scale (Good: $0.8 \leq \alpha < 0.9$; Acceptable: $0.7 \leq \alpha < 0.8$; Questionable: $0.6 \leq \alpha < 0.7$: Poor: $0.5 \leq \alpha < 0.6$; Unacceptable: $\alpha < 0.5$) (Cronbach, 1951)[40].

Measuring associations between scales of effect size in educational research

Creating an *ANOVA (eta²)*, η^2 is a measure of effect size and reflects the percentage of the variance in the dependent variable explained by the independent variables in a sample. Eta squared measures the proportion of the total variance in a dependent variable that is associated with the membership of different groups defined by an

independent variable. A brief description of the independent and dependent variable is differentiated. Effect size tells us how meaningful the relationship between variables or the difference between groups is. It indicates the practical significance of a research outcome was used with analysis of variance (ANOVA) to describe the proportion of variability associated with an effect of the difference between means of two datasets (Bhandari, 2022)[42].Cohen (1988)[43]suggested that η^2 = 0.2 (58%) be considered a 'small' effect size, 0.5 (69%) represents a 'medium' effect size and 0.8 (79%) a 'large' effect size. Effect size is a quantitative measure of the magnitude of the experimental effect. The larger the effect size the stronger the relationship between two variables (McLeod, 2019)[44].

Comparisons between students' perceptions of their actual and preferred variables

Student perceptions are their thoughts, beliefs, and feelings about persons, situations, and events that include classroom learning environment. A t-test is a statistical test that is used to compare the scale means of two variables. It is often used in hypothesis testing to determine whether a process or treatment actually has an effect on the population of interest, or whether two groups are different through actual and preferred students' perceptions are compared (Bevans, 2022)[45].

Associations between actual and preferred students' perceptions in their class

Coefficient Determinant Predictive Value (R^2): The coefficient of determination (R^2) is a statistical measure that represents the proportion of the variance for a dependent variable that's explained by an independent variable or variables in a regression model. The R^2 as the proportion of variation in the dependent variable that is predicted by the statistical model.The correlation coefficient R has already known then the coefficient of determination can be computed simply by squaring R, as the notation indicates that of percentage is reported (Fernando, 2021)[46].

Innovative lesson plan

In terms of the *12-Research-Based Learning Innovative Lesson Plan* (RBLILP), using the Index of Item Objective Congruence (IOC) and Assessment Form for the appropriateness of the learning management by the 5-professional expert educators were checked of their efficiency quality and appropriateness level for the RBLILP.

RESULTS

The efficiency quality and appropriateness level of the 12-Research-Based Learning Innovative Lesson Plan (RBLILP)

The 12-Research-Based Learning Innovative Lesson Plan (RBLILP) using the Assessment Form were checked Using the Index of Item Objective Congruence (IOC) was checked the efficiency quality of the 5-professional expert educators. Expert IOC values are based on having experts review the 12 RBLILP testing (+1 if they are sure that the questions measure the objectives, 0 if they are not sure that the questions are measured according to the objectives, and -1, if they are sure that the questionnaire can be measured, does not meet the objective). The IOC ranges from -1.00 to 1.00, and then interprets the result of the score as a percentage. The results of the examination of the IOC values from five experts found that the IOC value was 0.89 or 89%, interpreting that the IOC value of the 12 RBLILP innovative lesson plans had an ideal level of accuracy for the most appropriateness level that indicate was 4.55 for the RBLILP.

To integrate the problems and needs in developing the research-based learning management model to enhance research skills and systems thinking skills

To integrate the problems and needs in developing the research-based learning management model to enhance research skills and systems thinking skills Creative the 35-item *Research-Based Learning Management Questionnaire* (RBLMQ) includes 7 scales.

Table 2: Internal consistency (Cronbach alpha reliability) efficiency, item means, item standard deviation, item of variance, scale mean, *t*-test,and ANOVA (eta^2) was compared for the RBLMQ

Scale	Form	Alpha Reliability	Item mean	Item S.D.	Item of variance	Scale mean	*t*-test	ANOVA (eta^2)
CMS	Actual	0.732	16.818	2.083	4.338	3.364	3.389**	0.308**
	Preferred	0.747	18.886	3.149	9.917	3.777		
SPN	Actual	0.719	16.523	1.994	3.976	3.305	5.282***	0.158
	Preferred	0.763	18.954	3.401	10.365	3.791		
ICI	Actual	0.761	15.977	2.501	6.255	3.195	6.305***	0.276**
	Preferred	0.805	19.204	4.387	10.701	3.841		
FPI	Actual	0.674	16.227	1.853	3.436	3.245	2.712**	0.353**
	Preferred	0.743	17.636	2.861	8.190	3.527		
TRSS	Actual	0.630	16.545	1.388	2.928	3.309	4.189***	0.367**
	Preferred	0.768	18.864	3.047	9.283	3.773		
AKIC	Actual	0.617	16.636	1.241	2.539	3.327	3.434***	0.280**
	Preferred	0.710	18.364	3.066	9.400	3.673		
SCR	Actual	0.611	17.204	1.220	2.469	3.441	7.526***	0.114
	Preferred	0.733	19.841	3.198	8.951	3.968		
Totalized Data	Actual	0.818	115.932	7.995	63.925	3.312	6.010***	0.639***
	Preferred	0.918	131.750	14.667	215.122	3.764		

*N=44, *p<.05, **p<.01, ***p<.001*

Each scale consists of 5 items, namely: Conditional Make Sense (CMS), Student Problems/Needs (SPN), Identify/Clarify Issue (ICI), Find/Process Information (FPI), Think Research/Systemic Skills (TRSS), Apply Knowledge/Ideas Conclusion (AKIC), and Students Communicate Result (SCR). Using item means, item standard deviation, item of variance, scale mean, internal consistency (Cronbach alpha reliability) efficiency, *t*-test, and ANOVA (eta^2) analysis were analyzed and compared that reported in Table 2.

Validity for the RBLMQ

The internal consistency reliability of the RBLMQ version was determined by calculating Cronbach alpha coefficients for each scale of the RBLMQ that used both actual and preferred students' scores. Table 2 reports the internal consistency reliability of the RBLMQ, which ranged from 0.611 to 0.761 when using the students' actual scores and from 0.710 to 0.805 when using the students' preferred scores. These results suggest that the RBLMQ is a reliable instrument for use in *Preliminary Research Methodology class* was integrated the problems and needs in developing the RBLMQ model to enhance research skills and systems thinking skills of studeents.

Comparisons between students' perceptions of their actual and preferred Research-Based Learning Management model

Students' perceptions of their actual and preferredwere measured with the RBLMQ in the *Preliminary Research Methodology* class. The results given in Table 2 show the item mean scores

on seven scales. The minimum and maximum scores for each scale would be 5 and 25, respectively. The statistically significance of the difference between actual and preferred means was estimated using paired comparisons between different forms of the same scale using a t-test for dependent samples differentiated on all of seven scales, significantly (p<.05).Eta squared is a measure of effect size that is commonly used in ANOVA models. It measures the proportion of variance associated with each main effect and interaction effect in an ANOVA model. Table 2 showed the following rules of thumb are used to interpret values for partial eta squared ranging from 0.114 to 0.367 that interpretation of the results is the *Medium Effect Size* for the seven whole scales.

The scale means ranged from 15.977 ($\bar{\mathbf{X}}$ = 3.195 in Identify/Clarify Issue scale) to 17.204 ($\bar{\mathbf{X}}$ = 3.411 on the Students Communicate Result scale) on the actual form and ranged from 17.634 **(**$\bar{\mathbf{X}}$ = 3.527 on the Find and Process Information scale) to 19.841 **(**$\bar{\mathbf{X}}$ = 3.968on the Students Communicate Result scale) on the preferred form. The totalized data with average mean score shows off 3.312 and 3.764 that these results are interpreted of students' perceptions of their preliminary research methodology class to their actual and preferred research-based learning management model at the *Uncertain* and *Agree With* levels, respectively.

Research Skills Measurement (RSM) enhanced students' research skills of their participation in the research-based learning management model

Designing the 32-item *Research Skills Measurement* (RSM) *Formulating Questions, Observing, Planning, Collecting Data, Recording Data, Organizing Data, Interpreting Data*, and *Presenting Research*scaling steps were monitored and evaluated. The RSM includes 8 scales in five options; each scale consists of 4 items. The results as reported in Table 3.

As reported in Table 3, the eight scales of the 32-item *Research Skills Measurement* (RSM) Formulating Questions, Observing, Planning, Collecting Data, Recording Data, Organizing Data, Interpreting Data, and Presenting Research are valid and reliable with Internal consistency (Cronbach alpha reliability) efficiency for the actual ($0.627<\alpha<0.845$: acceptable)) and preferred (($0.717<\alpha<0.815$: acceptable) forms on the *Observing* and the *Collecting Data* scales, respectively. The η^2 interprets of the results in the *Medium Effect Size* for the RSM. The comparisons of the Actual with the Preferred Forms indicated that all of the eight scale means would prefer more actual students' perceptions with t-test analysis, differently (p<.05). The totalized actually mean score ($\bar{\mathbf{X}}$ = 3.101, indicates that of *Uncertain* level was interpreted), and mean score ($\bar{X}$ = 3.974, indicates that of *Agree with* level was interpreted) for the totalized preferred form of the RSM.

Table 3: Internal consistency (Cronbach alpha reliability) efficiency, item means, item standard deviation, item of variance, scale mean, t-test, and ANOVA (eta^2) was compared for the RSM

Scale	Form	Alpha Reliability	Item Mean	Item S.D.	Item of Variance	Scale Mean	t-test	ANOVA (eta^2)
Formulating Questions	Actual	0.758	11.866	2.000	4.010	2.972	7.957***	0.112
	Preferred	0.773	15.636	2.168	4.702	3.909		
Observing	Actual	0.627	12.091	1.951	3.805	3.023	9.975***	0.280**
	Preferred	0.717	16.273	2.139	4.575	4.068		
Planning	Actual	0.766	12.409	2.234	4.992	3.102	9.009***	0.211*
	Preferred	0.788	15.977	2.347	5.511	3.994		

Collecting Data	Actual	0.845	12.477	2.377	5.651	3.119	7.325***	0.157
	Preferred	0.815	15.646	2.417	5.790	3.911		
Recording Data	Actual	0.808	12.419	2.375	5.643	3.105	7.802***	0.154
	Preferred	0.714	15.536	2.121	4.455	3.884		
Organizing Data	Actual	0.842	12.795	2.378	5.655	3.199	7.324***	0.265*
	Preferred	0.805	16.250	2.297	5.319	4.063		
Interpreting Data	Actual	0.799	12.704	2.225	4.957	3.176	7.203***	0.439**
	Preferred	0.802	15.864	2.931	5.655	3.966		
Presenting Research	Actual	0.801	12.454	2.396	5.742	3.114	7.243***	0.152
	Preferred	0.806	15.886	2.354	5.805	3.972		
Totalized Data	Actual	0.948	99.227	14.743	194.928	3.101	10.743***	0.591***
	Preferred	0.959	127.159	15.216	231.529	3.974		

*N=44, *p<.05, **p<.01, ***p<.001*

To assess students' perceptions of their actual and preferred system thinking skills to enhanced students' research systems thinkingskills of their participation in the instructional strategies development with the research-based learning management model

Research System Thinking Skills have typically some of the following characteristics: the issue is important; the problem faced is not a one-off event; the problem is familiar and has a well-known history and junior physical students have unsuccessfully tried to solve the problem before. Designing the 28-item *System Thinking Skills Measurement* (STSM) consisted of 7 scalesin five options, each scale consists of 4 items and totalized of 28 items, namely: *Dynamic Thinking, System-as-Course Thinking, Forest Thinking, Operational thinking, Closed-Loop Thinking, Quantitative Thinking, and Scientific Thinking* was assessed students' perceptions of their actual and preferred system thinking skills in the research-based learning management classroom environment. The results were reported in Table 4.

Table 4: Internal consistency (Cronbach alpha reliability) efficiency, item means, item standard deviation, item of variance, scale mean, t-test, and ANOVA (eta^2) was compared for the STSM

Scale	Form	Alpha Reliability	Item mean	Item S.D.	Item of variance	Scale mean	t-test	ANOVA (eta^2)
Dynamic Thinking	Actual	0.727	12.545	1.980	3.928	3.136	8.533***	0.259*
	Preferred	0.710	16.068	1.909	3.346	4.017		
System-as-Course Thinking	Actual	0.641	13.500	1.732	3.000	3.375	5.891***	0.063
	Preferred	0.693	15.886	2.026	3.203	3.976		
Forest Thinking	Actual	0.697	12.227	2.112	4.459	3.057	7.710***	0.056
	Preferred	0.707	15.750	2.147	4.610	3.938		

Operational thinking	Actual	0.752	13.023	2.204	4.860	3.256	6.209***	0.241*
	Preferred	0.780	16.000	2.281	4.994	4.000		
Closed-Loop Thinking	Actual	0.625	13.341	1.598	2.555	3.335	6.462***	0.229*
	Preferred	0.711	15.909	2.181	3.294	3.977		
Quantitative Thinking	Actual	0.655	13.841	2.292	2.753	3.460	4.501***	0.215*
	Preferred	0.717	16.023	2.979	3.232	4.006		
Scientific Thinking	Actual	0.757	14.000	2.282	4.209	3.500	3.549**	0.104
	Preferred	0.790	15.636	3.274	4.378	3.909		
Totalized Data	Actual	0.845	92.477	8.922	79.640	3.303	9.280***	0.619****
	Preferred	0.869	111.273	9.548	91.180	3.974		

*N=44, *p<.05, **p<.01, ***p<.001*

Table 4 reported seven scales in five options, each scale consists of 4 items and totalized of 28 items, namely: Dynamic Thinking, System-as-Course Thinking, Forest Thinking, Operational thinking, Closed-Loop Thinking, Quantitative Thinking, and Scientific Thinking Research System Thinking Skills of the actual and preferred students' perceptions of the*System Thinking Skills Measurement* (STSM) are valid and reliable on all seven scales with the internal consistency (Cronbach alpha reliability) efficiency. The effect size of the STSM is *Medium Size*. Overall, the scale means of preferred students' perceptions are more than their actually perceptions. Statistically, significances are differentiated at .05 with t-test analysis for actual and preferred system thinking skills in the research-based learning management classroom environment provided.

Assessing actual and preferred students' satisfactionswith their research-based learning interaction in their classroom environment

Students' satisfaction can be defined as an attitude resulting from an assessment of students' educational experience, services, and facilities provided by the instructional strategies developed with the research-based learning management model toward their institution. Using the *Satisfaction of Learner Interaction Questionnaire* (SLIQ) for improving student satisfaction: Post the course syllabus on the Research-Based Learning Management Model (RBLMM), Administer a Learning-Styles Inventory (ALSI), Eexplain the Importance of Group Work (EIGW), Use Team Contracts (UTC), Use a Variety of Assessments (UVA), Be flexible (BeF), and Provide Frequent Interaction (PFI) scales. The RSM includes 7 scales in five options; each scale consists of 5 items and totalized 35 items. The results as reported in Table 5.

As reported in Table 5, the 35-item *Satisfaction of Learner Interaction Questionnaire* (SLIQ) in seven scales are improved student satisfaction of their *Research-Based Learning Management Model* (RBLMM) on the administer a learning-styles inventory (ALSI), explain the importance of group work (EIGW), use team contracts (UTC), use a variety of assessments (UVA), be flexible (BeF), and provide frequent interaction (PFI) scales. The RSM is valid and reliable with the Cronbach α-reliabilities for each scale. It's affecting size as Medium Size Effect by the η^2. Differences are significantly at .05 for all of 7 scales in five options. The totalized actually mean score ($\bar{\mathbf{X}}$ = 3.242, indicates that of *Neither Satisfied nor Dissatisfied leve*l was interpreted), and mean score ($\bar{X}$ = 3.606, indicates that of *Satisfied level* was interpreted) for the totalized preferred form for the SLIQ.

Table 5: Internal consistency (Cronbach alpha reliability) efficiency, item means, item standard deviation, item of variance, scale mean, t-test, and ANOVA (eta^2) was compared for the SLIQ

Scale	Form	Alpha Reliability	Item mean	Item S.D.	Item of variance	Scale mean	t-test	ANOVA (eta^2)
RBLMM	Actual	0.846	15.318	2.916	8.503	3.064	5.359***	0.068
	Preferred	0.617	17.773	1.568	2.459	3.555		
ALSI	Actual	0.632	16.454	2.085	4.347	3.291	2.915**	0.028
	Preferred	0.622	17.659	1.554	2.416	3.532		
EIGW	Actual	0.712	16.364	1.990	3.958	3.273	4.056***	0.150
	Preferred	0.648	17.841	1.613	2.602	3.568		
UTC	Actual	0.665	16.091	1.963	3.852	3.218	5.539***	0.047
	Preferred	0.630	18.182	1.514	2.202	3.636		
UVA	Actual	0.831	16.796	3.345	11.190	3.359	2.176*	0.112
	Preferred	0.685	17.886	2.316	3.731	3.557		
BeF	Actual	0.815	16.090	3.212	10.317	3.218	3.254**	0.048
	Preferred	0.679	17.917	2.501	3.525	3.595		
PFI	Actual	0.808	16.364	3.328	11.074	3.273	4.666***	0.054
	Preferred	0.718	18.886	2.645	4.708	3.777		
Totalized Data	Actual	0.918	113.477	13.679	187.139	3.242	5.648***	0.521**
	Preferred	0.850	126.204	7.083	50.166	3.606		

*N=44, *p<.05, **p<.01, ***p<.001*

This study attempted to identify what aspects of the *Preliminary Research Methodology* classroom learning environment with the instructional innovation through the Research-Based Learning Management Model influence actually students' research skills to their research system thinking skills, and their satisfaction with junior physical education interactional outcomes. The next section will discuss the results of the investigation of associations between actual students' perceptions of their Research-Based Learning Management Questionnaire (RBLMQ) scales (Independent variable) and Research Skills Measurement (RSM), Research System Thinking Skills, and Satisfaction of Learner Interaction Questionnaire (SLIQ) (Dependent variables) toward Preliminary Research Methodology class with scale average mean scores. Statistically, significance was assessed with *Pearson's Simple Correlation* (r) (to evaluate the direction of the variables), *Pearson's Multiple Correlation* (R) (to yield the maximum degree of liner relationship that can be obtained between two or more independent variables and a single dependent variable), the *Standardized Regression Weight* (β) (to estimate resulting from a regression analysis where the underlying data have been standardized so that the variances of dependent and independent variables), and the *Coefficient Determinant Predictive Value* (R^2) (to describe the proportion or percentage of the variance of the response variable explained by the model, and is a widely accepted summary measure of predictive power) were analyzed.

To investigate associations between actual students' perceptions of their Research-Based Learning Management Questionnaire (RBLMQ) and their Research Skills Measurement (RSM) toward Preliminary Research Methodology class

Because ofin this research study, it was also considered important to investigate associations between actual students' perceptions of their Research-Based Learning Management Questionnaire (RBLMQ) in seven scales and their Research Skills Measurement (RSM) (Cronbach alpha reliability of 0.959) toward Preliminary Research Methodology class. The summary of the results of these analyzes is reported in Table 6.

Table 6: Associations between actual RBLMQ and RSM to preliminary research methodology classin terms of simple and multiple correlations, standardized regression weight (β), andcoefficient determinant predictive value (R^2)

Scale	Simple Correlation (r)	Standardized Regression Weight (β)
Conditional Make Sense	0.700***	0.655***
Student Problems/Needs	0.678***	0.578***
Identify/Clarify Issue	0.628**	0.545**
Find/ Process Information	0.610**	0.539**
Think Research/Systemic Skills	0.634*	0.566*
Apply Knowledge/Ideas Conclusion	0.599*	0.526*
Students Communicate Result	0.605*	0.615**
Multiple Correlation (r)	0.7765**	
Coefficient Determinant Predictive Value (R^2)	0.6031**	

*N=44, *p<.05, **p<.01, ***p<.001*

The simple correlation values (r) are reported in Table 6 which show statistically significant (p<.05) and positive direction between students' research skills outcomes and the Research-Based Learning Management model on all scales of the RBLMQ. The more conservative standardized regression weight (β) compares the strength of the effect of each individual independent variable (RBLMQ on seven scales) to the dependent variable (actually totalized means of the RSM) correlation, significantly (p<.05).

The higher the absolute value of the beta coefficient, the stronger the effect is able to predict in the preliminary research methodology class. The multiple correlations (R) are significant for the Actual Form of the RBLMQ and show that when the scales are considered together there is a significant (p<.05) association with the RSM (R-value is 0.7765 indicates that a higher level of the standardized correlation at 0.700). The R^2 value indicates that 60.31% of the variance in students' research skills development outcomes of their research-based learning management instructional model in preliminary research methodology class was attributable to their perceptions of their RBLM model, significant (p<.05), relatively.

To investigate associations between actual students' perceptions of their Research-Based Learning Management Questionnaire (RBLMQ) and their Research System

Thinking Skills Measurement (STSM) toward Preliminary Research Methodology class

To investigate associations between actual students' perceptions of their Research-Based Learning Management Questionnaire (RBLMQ) and their Research System Thinking Skills Measurement (STSM) toward Preliminary Research Methodology class was associated as reported in Table 7.

As reported in Table 7, the r-values are positive directive correlations and statistically significant (p<.05), relatively between students' research system thinking skills outcomes for on all of 7 scales of the RBLMQ instructional model. The standardized regression weight (β) compares the effect of each individual independent variable (RBLMQ) to the dependent variable (the STSM) correlation, significantly (p<.05) in the preliminary research methodology class. The multiple correlations (R) are significant p<.05) when theRBLMQ scales are considered that relationships with the RSM (R-value is 0.7948 that a higher level of the standardized correlation at 0.700).

Table 7: Associations between actual RBLMQ and STSM to preliminary research methodology class in terms of simple and multiple correlations, standardized regression weight (β), and coefficient determinant predictive value (R^2)

Scale	Simple Correlation (r)	Standardized Regression Weight (β)
Conditional Make Sense	0.591*	0.499*
Student Problems/Needs	0.613**	0.553**
Identify/Clarify Issue	0.602**	0.542*
Find/ Process Information	0.674**	0.614**
Think Research/Systemic Skills	0.685***	0.622**
Apply Knowledge/Ideas Conclusion	0.701***	0.623***
Students Communicate Result	0.684**	0.621**
Multiple Correlation (r)	0.7948**	
Coefficient Determinant Predictive Value (R^2)	0.6305**	

*N=44, *p<.05, **p<.01, ***p<.001*

The R^2 value indicates that 63.05% of the variance in students' researchsystem thinking skills development outcomes of their research-based learning management instructional model in preliminary research methodology class was attributable to their perceptions of their research-based learning management model, significant (p<.05), relatively.

To investigate associations between actual students' perceptions of their Research-Based Learning Management Questionnaire (RBLMQ) and their Satisfaction of Learner Interaction Questionnaire (SLIQ) toward Preliminary Research Methodology class

Associations between actual students' perceptions of their Research-Based Learning Management Questionnaire (RBLMQ) and their Satisfaction of Learner Interaction Questionnaire (SLIQ) toward Preliminary Research Methodology class was investigated the analyzing results as reported in Table 8.

The summary results as reported in Table 8 show the r-values are positive direction, relatively and show statistically significant (p<.05) between

students' satisfaction outcomes for on all of 7 scales of the RBLMQ instructional model. The β-weight compares the strength of the effect of each individual independent variable (RBLMQ) to the dependent variable (the SLIQ) correlation, significantly (p<.05). The R-values are significant p<.05) when the RBLMQ scales are considered that relationships with the SLIQ (R-value is 0.8276 that a higher level of the standardized correlation at 0.700). The R^2 value indicates that 68.20% of the variance in students' satisfaction of their research-based learning management instructional model in preliminary research methodology class was attributable to their perceptions of their RBLM instructional model, significant (p<.05), relatively.

Table 8: Associations between actual RBLMQ and SLIQ to preliminary research methodology class in terms of simple and multiple correlations, standardized regression weight (β), and coefficient determinant predictive value (R^2)

Scale	Simple Correlation (r)	Standardized Regression Weight (β)
Conditional Make Sense	0.691**	0.593**
Student Problems/Needs	0.655**	0.558*
Identify/Clarify Issue	0.709***	0.704***
Find/ Process Information	0.785***	0.728***
Think Research/Systemic Skills	0.700**	0.684***
Apply Knowledge/Ideas Conclusion Students Communicate Result	0.747**	0.715***
	0.769***	0.719***
Multiple Correlation (r)	0.8276**	
Coefficient Determinant Predictive Value (R^2)	0.6820**	

*N=44, *p<.05, **p<.01, ***p<.001*

DISCUSSIONS

This reporting research examines ways in which students are enabled to engage with scholarship and research as an integral part of their learning experience throughout the Thailand National Sports University (TNSU), Lampang Campus. The authors of the report are leading experts in the 'research–based learning management model' in Higher Education (HE). Based on the study we have collected, describe a rich and varied landscape of scholarship in TNSU, contextualizing the TNSU experience within a wider, global consideration, drawing on experience from the UK, Australasia, Europe and North America. The report hence makes a major contribution to our understanding of the development of research-based curricula in TNSU Lampang Campus internationally. The discussion also validates the ways in which TNSU has developed their Higher Education curricula, and illustrates how these developments align to the most recent guidance on degree-awarding powers for all TNSU providers. The report offers an invitation to any college developing its HE provision, wherever it is based, to draw from its findings to develop a culture of research-based learning and teaching in their own institution, with physical education students.

A major gap in students' knowledge and understanding of the development of research-based curricula must current international debate concerns the form that research and scholarship should take in the TNSU sector. Most of these discussions have concentrated on the implications for staff/faculty being research active. In this publication we extend this discussion to how students in the TNSU, Lampang Campus may be engaged in research and inquiry, how curricula may be designed to achieve this and what departmental, institutional and national strategies are needed to foster these developments. We have argued previously that follow as the idea of Mick Healey, Alan Jenkins, and John Lea (2014)[47] "*All undergraduate students in all higher education institutions should experience learning through, and about, research and inquiry*". Here we explore how this argument may play out in the TNSU sector.

Engaging students in research-based instructional model: Getting students to produce knowledge rather than just consume knowledge is a way to re-link teaching and research; the challenge is to mainstream undergraduate research so that all students may potentially benefit; and Adopting a broader definition of undergraduate research than is currently common is a way forward, which should benefit the learning of students in institutions with a range of different missions (Healey, 2007)[48]. The impact of instructional integrating on research-based learning management method would be focused on students who both taught and conducted research demonstrates significantly greater improvement in their abilities to generate testable hypotheses and design valid experiments (Feldon et al., 2011)[49].

In the five stages of research-based learning, students: identify and clarify issues, questions, challenges, and puzzles; find and process information; think critically and creatively; apply knowledge and ideas and draw conclusions; and communicate results (Baldwin, 2005)[50]. One of the most important components of a successful research-based learning program is the ability to help students understand and apply this management consistently, by providing them with research-based opportunities for learning. Thus students are encouraged to bring in additional materials and resources to help the class understand a topic, choose and complete projects and performance tasks as part of their units of study, and discuss issues using evidence from sources of information. The classroom climate and environment continually encourage students to express their opinions, problem solve, and think at higher levels (Blackmore & Blackwell, 2009)[51].

The results of this research study confirm that the instructional strategies developments are techniques instructors use to help junior physical students become independent, strategic learners. These strategies become learning strategies when students independently select the appropriate ones and use them effectively to accomplish tasks or meet goals in accordance withChristine Persaud (2021)[52] reported that instructional strategies refer to the techniques instructors use to deliver their lessons. Effective instructional strategies help students become actively involved in the learning process. When done right, instructional strategies also support students in reaching their learning objectives.

Undergraduate students will develop research skills while some of their learning will be research-specific, undergraduate research also develops transferable skills with broad application, including critical thinking, problem solving, communication, collaboration, and independence. Some of the benefits of undergraduate research are listed below, along with comments from undergraduate researchers about their own experiences in these areas. A researcher at University of Connecticut invites that instructor or researcher should play a critically important role in students' research and creative experiences, challenging students to try new things and offering a window onto the thinking of an experienced researcher or practitioner (University of Connecticut, 2021)[53].

The results of this research study focused on the enhancing systems thinking skills for undergraduate students who have been become a seasoned systems thinker starts with a strong commitment to developing their own systems thinking skills by the research-based learning management model that in accordance with Woei Hung (2008)[a3]who reported that the effects of utilizing systems modeling as a cognitive tool in

enhancing a group of graduate students' systems-thinking skills. A significant improvement was observed in the systems-thinking practices of the students. A theoretical rationale for enhancing systems-thinking skills with modeling was discussed, and Barry Richmond (n.d.)[26]said that teaching the generic, operational, and empathic thinking skills needed to "speak/write it" effectively can go a long way toward improving the student communication capacities needed to realize the synergies latent within a multi-discipline curriculum.

Finally, Alan Jenkins and Mike Healey (2011)[55[]] told that the research universities have often failed, and continue to fail, their undergraduate populations, thousands of students graduate without seeing the world-famous professors or tasting genuine research. At point to the research and policy perspectives that demonstrate that research and teaching often clash and or fail to connect in the student and faculty experience of higher education. Most of universities should treat learning as not yet wholly solved problems and hence always in research mode. We want to integrate research into every stage of an undergraduate degree, moving research-based instructional management model.It is essential that students are aware of the research which goes on in their departments. Some claim that the best researchers are usually the best teachers.

CONCLUSION

In this study, appropriate statistical procedures were analyzed; in order to validate the 12-Research-Based Learning Innovative Lesson Plan (RBLILP) in 15 weeks. Designing the *Assessment Form* was checked in five options (1-5 suitability levels) by 5-professional expert educators. In was found that in the 12-RBLILP the mean efficiency quality and appropriateness is 4.55, and the IOC shows off 0.89, which interprets the most appropriateness level. The four research instruments, include: the 35 items in 7 scales of the *Research-Based Learning Management Questionnaire* (RBLMQ), the 32 items and 8 scales of the *Research Skills Measurement* (RSM), 28 items in 7 scales of the *System Thinking Skills Measurement* (STSM), and the 35 items in 7 scales of Satisfaction of Learner Interaction Questionnaire (SLIQ) were assessed actual and preferred students' perceptions in five options: Strongly Agree, Agree, Uncertain, Disagree, and Strongly Disagree levels.Research-Based Instructional Strategies for setting objectives and providing feedback provide direction for learning, acknowledge student interest and investment, and encourage students to complete assignments in enhancing research skills and systems thinking skills for 44 junior physical education students at Thailand National Sports University, Lampang Campus in Preliminary Research Methodology class are integrated.

Most of the four research instruments on actual and preferred forms by students' perceptions outcomes are valid and reliable with the internal consistency (Cronbach alpha reliability) coefficient ($0.60<\alpha 0.80$), and showed that the affecting sizes are Medium Effect Size with the ANOVA eta^2. The preferred scale means would prefer than actually students' responses and statistically significant is differentiated with the actual and preferred students' perceptions on all scales on four research instruments, significantly ($p<.05$) indicated that were compared. In terms of students' perceptions of their actual form with scale means are *Uncertain levels* and *Agree with* or *Satisfied* levels for the preferred form.

Associations between students' perceptions of their RBLMQ in 7 scales (independent variable) and the totalized mean scores of the RSM, STSM, and the SLIQ (dependent variables) are positive directions with simple correlations, the two variables are able to predict to the relationships with standardized regression weight (β), significantly. Most of the multiple correlations (R) are more than the standard correlation as 0.700 and correlative significantly. The R^2 values indicate that 60%, 63%, and 68% of the variances in students' research skills, students' systems thinking skills, and their satisfactions to their research-based learning management model in Preliminary Research Methodology class was attributable to their perceptions of their Research-Based Learning Management instructional model, respectively.

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