Application of the Technological Pedagogical Content Knowledge (TPACK) Learning Model in the Student Measurement and Evaluation Test Course in the Department of Sports Education

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This research is motivated by the problems encountered in the field, which include students' inability to think critically, construct learning materials, and effectively utilize technology to support learning. As a result, a learning model is required to design by integrating three major aspects: technology, pedagogy, and content. The measurement and evaluation test course are the learning model that will be developed in this study using technological pedagogical content knowledge (TPACK). Because this course requires students to have pedagogical knowledge, technological knowledge, and content knowledge from lectures; students must also be able to practice using instruments and analyze all information obtained from the measurement process. The classroom action research method was used in two cycles with 20 students. Each cycle comprises three parts: action planning, observation, and reflection. Data collection methods include tests, and data analysis methods include quantitative descriptive statistics. Improving measurement test learning outcomes and evaluating student physical education through the TPACK approach, which has a positive influence or impact as indicated by an in-crease from the pre-cycle.

Keywords: TPACK, tests, measurement, evaluation

INTRODUCTION

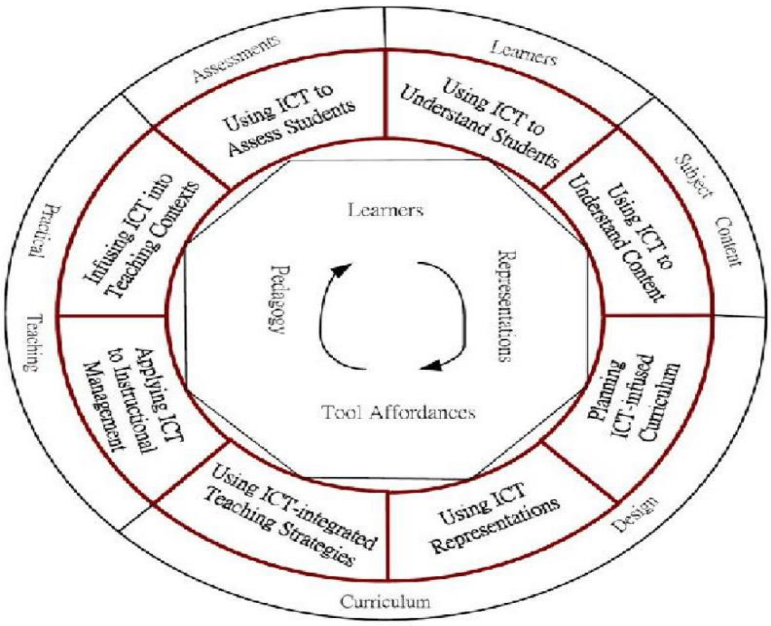
Technological advancements have had a significant impact on the educational process, changing the lecturer's role and the characteristics of students, demanding orientation and innovative ways of learning.

The role of a lecturer must be adjusted primarily due to a shift in the characteristics of millennial generation students to those of the z generation. This term represents the twenty-first century generation (Cloud, 2022). Many learning changes have been felt, including changes in learning patterns, changes in need orientation, and changes in students' learning habits in the twenty-first century. Based on the phenomenon that lecturers are currently experiencing, there is a need for a learning model that integrates technology into learning and combines knowledge about pedagogy, knowledge about content, and knowledge about technology so that it can be used to improve learning quality (Ulfah & Erlina, 2022).

The teacher should apply it to the measurement and evaluation test course, a mandatory course that students must take and serves as a guideline for students to complete their studies in the Sports Education department, guided by the changes occurring in the world of education. The objective of the said course is for students to master the knowledge and practice of measuring tests and physical education evaluation. Stu-dents will be able to prepare tests and non-tests, understand the validity and reliability of tests and non-tests, take measurements, convert scores into values, and evaluate in sports and physical education. Learning in higher educational institutions should use the appropriate learning approach to achieve the learning objectives effortlessly. Nevertheless, with a still monotonous, conventional method, student learning outcomes can be expected to be low or below average for the minimum completeness criteria (KKM), which only reaches 30%. Therefore, this research is necessary to determine learning problems and efforts to improve student learning outcomes, particularly for measurement and evaluation test courses. Based on the results of problem identification, student learning outcomes remain poor (the average is less than the KKM of 37.5%) (Kurniasari & Mardikaningsih, 2022). It is because the traditional learning approach has not improved student learning outcomes. Based on these issues, a learning model that teaches students to think at a higher level (Higher Order Thinking/HOTS), specifically the technological pedagogical content knowledge (TPACK) learning model, needs to be implemented. According to the author, in tpack learning, students will think critically and be able to solve problems, they will have creativity and innovation, they will understand cross-cultural issues, they will have communication skills, information and media literacy, and information technology literacy skills, and they will have life and career skills (Farikah & Al Firdaus, 2020). Creating a technological pedagogical content knowledge (TPACK) learning model for PE measurement and evaluation test courses that can be used by team teaching courses at the Department of Sports Education particularly, and faculties of sports science in general.

The advancement of information and communication technology has had a significant impact on the learning process, the twenty-first century encourages both lecturers and students to comprehend information and communication technology. According to (Rahmadi, 2019), the concept of technological pedagogical content knowledge (TPACK) involves seven domains of knowledge that involve new slices and synthesis, namely: (1) material knowledge, which is mastery of the field of study or learning material; (2) pedagogical knowledge, particularly knowledge about processes and learning strategies, (3) technological knowledge, specifically knowledge of how to use digital technology, and (4) technological knowledge, including knowledge of how to use digital technology. (4) knowledge of pedagogy and materials, knowledge of the field of study or learning materials combined with learning processes and strategies (5) techno-logical and material knowledge, primarily knowledge of digital technology and knowledge of study areas or learning materials (6) knowledge of technology and pedagogy, notably digital technology and learning processes and strategies (7) knowledge of technology, pedagogy, and materials, more specific knowledge of digital technology, knowledge of learning processes and strategies, knowledge of the field of study, and knowledge of learning materials. TPACK, by definition, is a framework for integrating technology into the learning process that consists of a collection of knowledge about technology, materials, and learning processes or strategies (Schmid et al., 2009). For a practical description of the real-world implementation of TPACK in learning in-volving eight knowledge domains (Mishra & Koehler, 2008), see:

FIGURE 1
PRACTICAL TPACK TECHNOLOGY INTEGRATION FRAMEWORK



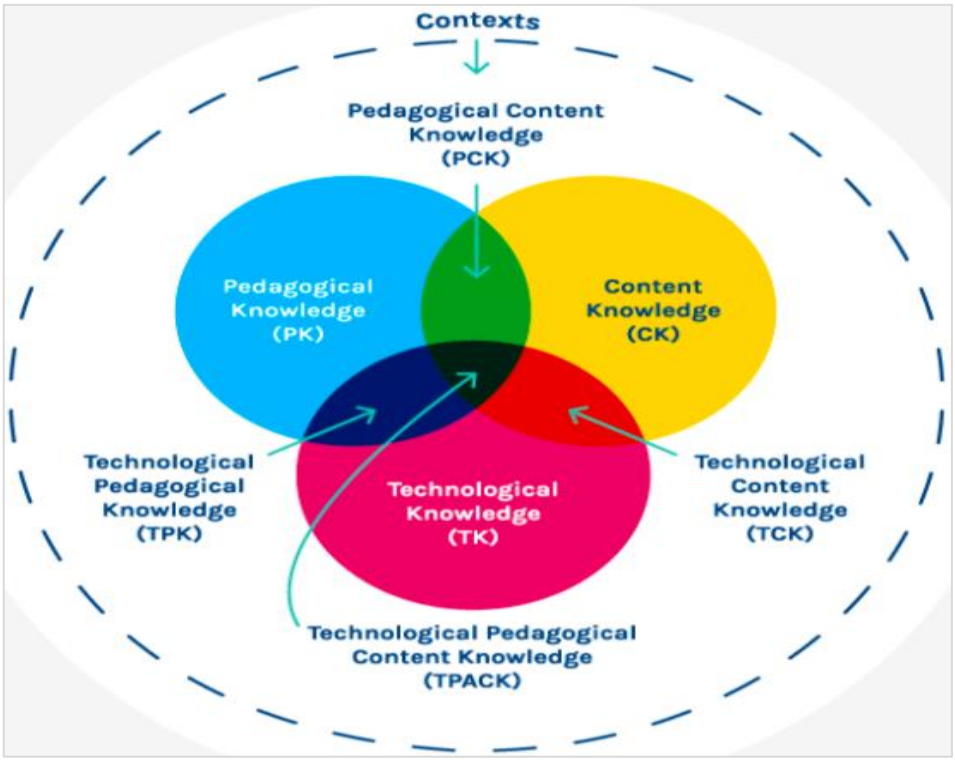
The ability of lecturers to organize learning by integrating learning strategies and technology is referred to as technological pedagogical content knowledge (TPACK). Therefore, this distinguishes the depth of competence mastery for each subject lecturer (Aisyah et al., 2021). TPACK is a Kindergarten optimization used in learning to integrate CK, PK, and PCK into a unified whole that can result in a more effective, efficient, and interesting learning process (Rahman, 2015). The learning process in question prioritizes cognitive mastery, student attitudes, and character formation. The validity of TPACK is required for a lecturer to implement PCK so that learning approaches, strategies, methods, and techniques can be adapted to the specifications of the learning content (Perdani & Andayani, 2022). By incorporating technology into the TPACK approach to learning, lecturers can streamline pedagogical practices and better understand concepts. Laptops, LCD projectors, Microsoft PowerPoint as learning media, videos, YouTube, smartphones, and the internet are among the technologies used. The TPACK approach aims to improve students' learning experiences by developing lecturers' creativity and skills in using technology in learning (Tes et al., 2021).

It must be recognized that technology will rapidly change the face of education and turn the world of education on its head (Rizqiyah, 2021). This means that the first side of a lecturer carrying out a mandate in the world of education is simply being a spectator. In contrast, the second side of a lecturer carrying out a mandate in the world of education is lecturers being active players who present quality learning for the benefit of students and help achieve national education goals. Meanwhile, current students see their characteristics as distinct from those of millennials. When viewed through the lens of learning objectives, it undoubtedly has new orientations due to scientific developments (Satriawati et al., 2022). These modifications have the effect of altering the lecturer's role. It is hoped that to be better prepared to anticipate change and even develop new, more visionary orientations (Herizal et al., 2022), a strategic role in building a learning culture for the younger generation is required by increasing the role of lecturers as educators in the twenty-first century so that students can become active sub-jects who produce knowledge rather than passive objects which become consumers of knowledge (Rosyid, 2017).

The fundamental idea behind TPACK is to emphasize the connection between subject matter, technology, and pedagogy (Harris J., Mishra, P, and Koehler, M, 2009). The interaction of these three components has the potential and appeal to promote student-centered active learning. It can also be

interpreted as a shift in learning from a teacher-centered to a student-centered model. TPACK emphasizes the interactions that exist between technology, curriculum content, and pedagogical approaches. There is a relationship between the constituent components, intersecting material (C), pedagogy (P), and technology (T), which are influential in the learning context, in the TPACK scheme.

FIGURE 2
RELATIONSHIP BETWEEN TPACK FRAMEWORK



The graphic depicts the relationship between the three components. C, P, and K are the components, and C becomes (CK). P becomes (PK), and T becomes (TK), and the relationship between the components is as follows:

1. ***Content Knowledge (CK)*** or knowledge of the subject to be studied. The material has been included in the curriculum. The curriculum's subject matter boundaries should be interpreted holistically for high school students studying Chemistry, Physics, Biology, and Mathematics. Shulman et al. (1986) indicated that the subject matter includes knowledge in the form of concepts, theories, ideas, frameworks, methods supplemented by scientific methods, and their application in daily life. Some examples include acid-base concepts, theory, natural indicators, acid-base indicators, solution pH, and acid or base ionization constants.
2. ***Pedagogy Knowledge (PK)*** CK refers to in-depth knowledge of teaching and learning theory and practice, such as objectives, processes, assessment learning methods, strategies, etc. Pedagogical knowledge necessitates understanding cognitive, affective, and social aspects, along with the development of learning theory and its ap-plication in the learning process. Teachers must thoroughly understand and focus on the necessary pedagogy, particularly how students understand and construct knowledge, attitudes, and skills (Koehler et al. 2011). Examples: constructivism, Scientific, Discovery Learning, Problem-based Learning, guided inquiry, question and answer, discussion, presentation, observation, and practicum.

3. ***Technology Knowledge (TK)*** indicates the fundamentals of technology that can be employed to support learning. Examples include software, animation programs, internet access, molecular models, virtual laboratories, and other technologies. As a result, teachers must be experts in information processing and communicating with ICT in the classroom. Mishra et al. emphasized the importance of basic knowledge, technological knowledge, and the ability to apply it to support understanding of the subject matter being studied. Furthermore, mastery of this technology is a requirement for students in the twenty-first century (Jordan, K. 2011). Examples: google drive, OneNote, ChemDraw, chem sketch, Prezzi, Edmodo, Youtube, Ulead, Windows movie maker, Avidemux, jmol, hyperchem, chemtool, bkchem, Lectora, moodle, Dokeos, ATutor, internet, laptop, LCD, video, powerpoint.
4. ***Pedagogy Content Knowledge (PCK)*** encompasses interactions and intersections between pedagogy (P) and subject matter (C). According to Shulman in Koehler et al (2011), PCK is a learning concept that delivers the curriculum's subject matter. It includes the learning process and the student assessment system for the studied subject matter. The learning model is expected to provide participants with the necessary tools to learn effectively. Understanding the relationship and intersection of (P) and (C), with a focus on how (P) can influence (C). PCK, according to Koehler, is a body of knowledge, a course of study. General pedagogy, knowledge transformation, and learning strategies in educational contexts (Mishra, P., & Koehler, M. J. 2006). Examples include discovery learning and constructivism as strategies for learning acid-base concepts, guided inquiry as a strategy for learning natural indica-tors, and student discussions on acid-base concept material in everyday life.
5. ***Technology Content Knowledge (TCK)*** involves comprehending technology and subject matter that can help and influence other components (Mishra, P., & Koehler, M. J. 2006). Examples include using Google Drive to store Student Worksheets (LKS) on natural indicator material, Prezzi, and YouTube to learn acid-base indicators, and Edmodo to submit assignments on pH questions of strong acid and strong base solutions.
6. ***Technology Pedagogy Knowledge (TPK)*** is a set of understandings about how learning changes occur when technology supports active learning and can help simplify subject matter concepts. TPK necessitates comprehending the required technology's benefits and drawbacks as it is applied in the context of the subject matter encountered during the learning process (Schmidt et al. 2009). For example, utilizing Prezzi and YouTube to facilitate guided inquiry in discussing acid-base indica-tors, or using Google Drive with Student Worksheets (LKS) to support Discovery Learning in investigating natural indicators.
7. ***Technology Pedagogy Content Knowledge (TPACK)*** is a learning series in which the ability to master technology is integrated and cannot be separated from its constituent components (C), (P), and (K). Multiple interactions and combinations of components, including subject matter, pedagogy, and technology, are required for TPACK. According to Mishra and Koehler, the concept of integration is the involvement of various domains/components of material and pedagogy that may assist teachers. Prezzi and YouTube with guided inquiry strategies, for example, can help students understand acid-base indicator material, while Google Drive, which contains Student Worksheets (LKS) with a discovery learning strategy, can help students discover and analyze natural indicators.

Stoilescu (2015) claims that using Technological Pedagogical Content Knowledge (TPACK) in practice and learning research has several significant benefits, including:

1) Technological Pedagogical Content Knowledge (TPACK) demonstrates consistency in incorporating technology use in various contexts.

2) This framework has a fairly well-established theoretical foundation by exploring the integration of ICT in the classroom and emphasizing the interrelationships between technology, pedagogy, and content.
3) Activities in the classroom can be tracked and analyzed by remaining conscious of the three main aspects (technology, content, and pedagogy).

According to Koehler, Hall, Bouck, and Wolf (2011), whereas TPACK has sever-al advantages, it also has two drawbacks, including (1) New technologies frequently create new opportunities for representing content and pedagogy that did not previously exist; (2) most technologies used by lecturers are typically not designed for educational purposes but are instead used for office, business, and other purposes.

Educators define learning and learning objectives. Educators will conduct learning activities after determining the learning objectives and preparing learning tools. The educator conducts an assessment at the end of the learning activity to determine students' learning outcomes (Haka et al., 2020). A good, appropriate, and high-quality assessment instrument is required to discover all of this. Students are now familiar with the use of technology. As a result, lecturers must adapt to the characteristics of students familiar with and accustomed to using technology when teaching. TPACK (Technology Pedagogical Content Knowledge) is a learning approach that utilizes ICT. Technological Pedagogical And Content Knowledge (TPACK) is a lecturer's understanding of student learning of specific content using pedagogical and technological approaches. (Cox & Graham, 2009).

Furthermore, according to the study's findings: (1) According to Jang and Tsai (2020), Exploring the TPACK of Taiwanese Elementary Mathematics and Science Teachers concerning the Use of Interactive Whiteboards, the use of the TPACK model for mathematics and science teachers affects the ability of partial teachers. (2) According to the findings of Erdogan and Sahin's (2019) study titled Relationship between Math Teacher Candidates' Technological Pedagogical and Content Knowledge (TPACK) and Achievement Level, using TPACK can improve student achievement results. (3) Olofson, Swallow, and Neumann's research findings (2021) with the title: TPACKing: A Constructivist Framing of TPACK to Analyze Teachers' Construction of Knowledge states that the use of TPACK is effective for building teacher constructions in positions to provide learning opportunities related to technology integration. (4) The findings of Saengbanchong's (2020) study, Validating the Technological Pedagogical Content Knowledge Appropriate for Instructing Students (TPACK-S) of Pre-service Teachers, claim that teachers who have TPACK will improve student achievement.

The development of the technological pedagogical content knowledge (TPACK) learning model for physical education measurement and evaluation test courses intends that it can be used by team teaching courses in sports education departments in particular and sports science faculties in general. This study aims to collect data and information about Efforts to Improve Learning Outcomes in the measurement and evaluation test course using the technological pedagogical content knowledge (TPACK) learning model. This study provides insight for developing new theories about improving learning outcomes in the measurement and evaluation test subject through applying the technological pedagogical content knowledge (TPACK) learning model in the measurement and evaluation test course. Implementing classroom action research (CAR) is tremendously beneficial for students concerning increasing motivation, student learning process activities, and optimizing learning outcomes. CAR can be implemented by lecturers as relevant research to conduct learning studies that are compatible with the subjects studied. This CAR provides value because the results of this CAR are feasible to develop new policies to improve and ensure the quality of education in educational units. This TPACK will be used in lectures on physical education measurement and evaluation tests.

Test, Measurement, and Evaluation are three different but interconnected terms. Because many people do not understand the distinction and relationship between the three, the term is frequently misused. To be unambiguous, the differences and connections between the three terms mentioned above will be discussed in this part of this study. Tests are instruments or tools useful to gather information about people or things (Ismaryati, 2006). Miller (2002) defines tests as "instruments or tools used in a measurement to obtain information or data." As an instrument for obtaining information or data, tests must be specifically designed. Ismaryati (2006) defines measurement as the process of collecting data or information objectively. Measurement is commonly thought of as a quantitative process, assigning a number to a person's performance or an attribute (Miller, 2002). It is possible to control and evaluate all pro-grams related to developments in any field by measuring them. The measurement results are quantifications of distance, time, amount, size, and others. The measurements' results are expressed as numbers that can be statistically processed. Conversely, evaluation is the process of determining the gathered value or price. The process of

giving consideration or meaning to the value and meaning of something being considered is known as evaluation. Giving considerations to value and meaning cannot be done haphazardly; evaluation must be done in compliance with certain principles. The evaluation of an activity is always done concerning the goals that must be reached.

Tests are an essential component of measurement. As a consequence, tests and measurements cannot be separated. Measurement provides a method for gathering the necessary information. (1) A test is a measuring device or instrument used to gather in-formation/data about a specific person or object. The information obtained as an attribute or property associated with the individual or object in question. The information gathered includes cognitive, affective, and motor domains. Written (essays, objective) and oral tests collect cognitive data. Affective data can be gathered using attitude scales, questionnaires, and direct observation of the object to be measured. At the same time, motor data can be gathered through tests of basic, functional abilities and movements and via sports skills tests. (2) Measurement is the process of gathering data/information about specific individuals and objects, beginning with the preparation of measuring instruments and ending with the results (for example, frequency, distance, time, and temperature unit of measurement). The outcomes are quantitative measurements. Thus, measurement denotes "a process for obtaining objective and quantitative data whose results can be statistically processed." (3). Evaluation is the process of determining the significance or feasibility of collected data. The results are qualitative because they are based on criteria or comparison (within the group or from outside, in the form of a standard) in giving meaning to the measured data.

Tests and measurements can be implemented using pre-existing standardized tests or creating custom ones. Implementation of tests and measurements will be valuable in fulfilling the needs of teaching programs, including (a) inspiring educators to achieve goals, (b) providing feedback for educators and students, (c) generating learning motivation, (d) assisting students in assessing their abilities, (e) aiding educators in reorganizing previously given teaching materials, (f) as a tool to obtain objective data, and (g) diagnostic needs (body mechanics, physical fitness, and movement skills (h) determine a student's final grade impartially. Furthermore, there are two principles for evaluation, particularly: (1) Implementation Principle: the principle governing how evaluation is carried out, namely that evaluation must be carried out objectively, continuously, and comprehensively (integrality). (2) fundamental principles: namely, as work guidelines in conducting evaluations, namely, evaluation is a communication tool, assisting students to achieve the maximum possible development of their potential, don't just compare them with others, use various types of evaluation tools/techniques, and suggest steps/actions that need to be taken further.

Possible evaluation mistakes include 1) mistakes during observations, 2) errors in measuring devices, 3) inaccuracies in the data analysis process, 4) the influence of previous works, 5) the tendency to rate higher or lower, and 6) the influence of external impressions. The steps in carrying out the evaluation are as follows: (1) planning criteria to be used, type of test/measuring instrument to be used, determining the frequency of evaluation, facilities, and equipment, time for data collection, data collection assistants, (2) data collection, (3) research, (4) data processing, and (5) data interpretation are all required. Furthermore, for the research form or type, including: 1) Formative Evaluation: Conducted on the sidelines of ongoing programs, such as weekly or monthly tests, to monitor needs and obtain feedback. The data is used to improve the program. 2) Summative Evaluation: Administered after the training program has been completed, for example, to determine/select players. The results of evaluations are reported in numerical form.

Most tests and measurements always deal with revealing test results in the form of (quantitative) scores that can then be conveniently processed, particularly by employing statistics. Furthermore, a trainer must consider and recognize the collection of qualitative data, the results of which are in the form of exposure to the level of competence or performance in the field in its implementation, qualitative evaluation employs the usage of subjective considerations/assessments. Consequently, the fundamental guidelines are as follows: 1) the ability to be assessed must be defined; 2) the assessor must be trained and experienced; 3) the assessor must be able to distinguish ability levels; 4) the rating scale must be simple and proportional to the ability level of the group; 5) the assessment must be based on sufficient evidence, such as the length

of observation and the number of observers; and 6) the assessor must have discretion in making an assessment. Further-more, the evaluation strategy can be implemented as follows:

1) Absolute Criteria or Criterion-Referenced Standard, also called Benchmark Reference Assessment (PAP). This benchmark reference approach (PAP) evaluates student learning processes and outcomes to a predetermined benchmark or standards. A student who meets or exceeds these benchmarks is considered successful or passed.
2) Criterion-Referenced Norm or Group Criteria, frequently called Norm Reference Assessment (PAN). This normative reference assesses students by comparing their scores to the group's average score as the norm. This method uses the normal curve, group mean (Mean), and standard deviation as references.
3) A combination of PAN and PAP. The passing grade is determined first, followed by the grade category for students who pass.

METHODOLOGY

This type of research is classroom action research, a reflective study conducted by lecturers to improve the learning process for which they are responsible. It has the goal of enhancing student learning creativity. This classroom action research follows a cycle model advocated by Kemmis and McTagart. The cycle model developed by MC Taggart of Deakin University Australia is the research model for the type of conducted research, namely classroom action research. This cycle model consists of four parts: plans, actions, observations, and reflections.

Changes will be made in each cycle of plans to improve student learning out-comes. This action research is carried out continuously until it obtains the desired results. One of the cycle changes occurs following the changes in the first cycle, which begins with plans, actions, observations, and reflections.

1. Cycle 1

1) Planning
    a. Prepare class action research schedule
    b. Planning material to be carried out during research to find out the basic competencies that will be conveyed to students in learning
    c. Prepare syllabus
    d. Prepare RPS following the material to be discussed
    e. Prepare an observation sheet
2) Implementation of actions

Introduction

a. The lecturer and students pray together.
b. The lecturer inquires about student updates and verifies student attendance.
c. Lecturers give motivation to students
d. Execute actions that correspond with the implemented model.

Core Activities

a. The lecturer conveys the learning objectives that must be achieved
b. Doing group discussions
c. Students present the results of the discussion in front of the class with the help of pictures and videos
d. The lecturer simultaneously conducts questions and answers with the help of pictures and videos
e. The lecturer refines the discussion's outcomes and confirms the out-comes of student work.
f. The lecturer provides feedback to active students at the end of the lesson.

Closing

a. The lecturer concludes the learning process with the students.
b. The lecturer conveys learning material for the following meeting.

3) The lecturer finishes the lesson with a prayer.
4) Observation

   Observation activities are those performed on students by lecturers during the learning process of measurement and evaluation tests. The activities observed here are the results of the student learning process from measurement and evaluation tests.
5) Reflection

   In the following cycle, reflection is used as a reference or guideline to improve the weaknesses identified in cycle I using the technological pedagogical con-tent knowledge (TPACK) learning model.

This research method employs CAR (Classroom Action Research), which is used to solve or find solutions to problems in the classroom. The goal of this research is to im-prove and improve the classroom learning process. According to Kemmis and Taggart, there are several stages in the CAR design, beginning with planning, implementing, observing, and reflecting. The cycle used is the one specified (Kemmis and Taggart in Rochiati, 2006). The model and explanation of the model cycle are problems, action planning I, action implementation I, observation/data collection I, reflection I, and the results of reflection if new problems are discovered. The steps are action planning II, action II implementation, observation/data collection II, and reflection II. Continue to the next cycle if the problem has not been resolved.

This study was carried out at Padang State University's Department of Sports Education, Faculty of Sports Science, which took the 2023 Physical Education Measurement and Evaluation Test course. The data collection technique used in this study was a test administered to students to assess their ability to understand the material in the semester learning implementation plan after being given action. This classroom action research, namely descriptive quantitative, describes the learning outcomes of the Physical Education measurement and evaluation test course whose grades are higher than the average student course completeness score, which is higher than a score of 70. The calculation results are classified as complete. Study with a value less than 70, indicating incomplete, and a value equal to or greater than 70, indicating complete or passed. As a result, the lecture is considered successful if students meet the assessment indicators.

RESULTS

In the initial conditions, the percentage of completeness of student learning out-comes is 30%. It is because lecturers continue to use conventional approaches, making it difficult for students to grasp student development material, which impacts student learning outcomes, resulting in poor grades. Lecturers perform conventional and monotonous learning in pre-cycle conditions, which means that lecturers provide learning material without employing the TPACK learning system.

The percentage of completeness of student learning outcomes was obtained at 50% in cycle I, indicating that half of all students completed their learning outcomes in cycle I. The increase was 20% from pre-cycle to cycle I. When the TPACK learning model is used, student learning outcomes improve. As a result, students are more engaged in class, and the atmosphere is more enjoyable. The lecturer completed the components and syntax of the TPACK learning model in this first cycle. However, several aspects of the assessment were not properly completed. Students' attention has not been fully focused on the lecturers' use of learning materials and videos. As a result, while there is an increase, it is not in line with the expected target. Cycle II will ad-dress this issue.

Compared to the cycle I result, the completeness score of student learning out-comes increased by 40% in cycle II. Students' learning outcomes in cycle I were 50%, and in cycle II, they improved to 90%. It is due to the lecturer properly carrying out all aspects of the assessment, resulting in a 40% increase from the previous 50% learning process in the second cycle to 90%. Compared to the previous cycle, students in cycle II appeared more enthusiastic and active in participating in lectures. This is because more lecturers can provide opportunities for students to participate. Specifically, learning videos are accessible via each student's mobile phone. When learning is enjoyable, students pay close attention. As a result, student

observation data increased significantly as a result of this. Table 1 shows a percentage comparison of student scores.

TABLE 1
COMPARISON OF PRE-CYCLE, CYCLE I AND CYCLE II VALUES

Num.	Explanation	Pre-Cycle	Cycle I	Cycle II
1	Complete	7 (35%)	11 (55%)	17 (85%)
2	Incomplete	13 (65%)	9 (45%)	3 (15%)

According to Table 2, student learning outcomes using the TPACK learning model based on the learning management system show an increase from Pre-Cycle 35% of students complete learning, in Cycle I 55% of students complete learning, and in Cycle II 85% of students complete study. Students who completed learning from Pre-Cycle to Cycle I increased by 20%, and students who completed learning from Cycle I to Cycle II increased by 30%. According to the findings of this study, the TPACK learning model based on the learning management system successfully im-proved student learning outcomes in the Department of Sports Education, Faculty of Sports Science. It can be stated that learning using the Technological-Pedagogical-Content-Knowledge Model (TPACK) can improve student learning outcomes in physical education measurement and evaluation tests because there is an increase with each cycle. The action hypothesis can be stated to be acceptable.

Cycle 1

Cycle I learning activities are divided into four stages, which are as follows:

1. The Planning Stage a) develops a learning implementation plan, b) creates learning strategies and scenarios for TPACK implementation, and c) identifies achievement indicators for the success of the classroom learning process. d) assembling research instruments, such as assessment and observation sheets.
2. Action Implementation Stage a) Explain learning objectives to students at the initial stage of the activity. B) Using laptops, projectors, Microsoft PowerPoint to attract students, and learning videos to implement the TPACK approach in classroom learning activities. C) Students are given evaluation questions to complete as part of the assessment. The educator begins the learning activity by greeting the students, asking how they are doing, praying, attending attendance, doing apperception, and conveying the learning objectives to be achieved after completing the learning process.

   Following the start of the early learning activities, the lecturer asked the students, “What do you know about tests and measurements?” “What tests are you familiar with?” Question and answer sessions are conducted by lecturers and students, followed by a presentation of material using PowerPoint media. The TPACK approach is used to carry out learning activities. The lecturer distributes the question sheets, and students work on the answer sheets before coming to the front of the class to present their answers. Each student has the opportunity to ask questions during this activity. Lecturers reinforce student responses and opportunities for students to ask questions about material that is still unclear. The lecturer then explained measurement and evaluation tests in the following activity. Students are shown how anthropometry and sports skills tests are performed, and then the lecturer divides the class into four groups. Each group discussed anthropometry and athletic skill tests. Then, alternately, one group member is allowed to make a presentation in front of the class. Other members of the group share feedback and ask questions. The final learning activity involves practicing for the test. Each student watched a projector-projected video of a skill test in one of the sports. Several students approached the front of the class to perform the movement. During the final activities, lecturers and students reflect on their learning, conclude, and evaluate. The learning activities were then concluded with greetings and prayers.

3. Observation Stage. The researcher observes data and information on the ongoing learning process at this stage to determine the suitability of the design and learning objectives. The evaluation is carried out to determine the achievement of student learning outcomes in learning activities.
4. Reflection Stage. The fourth stage of the learning cycle I is reflection activities, a thorough review of the actions taken. The researcher evaluates the analysis of student learning outcomes that have taken place during the reflection stage. If student learning outcomes remain low or incomplete, improvements will be made in the following cycle.

Evaluation or assessment is a process that measures student competence in learning to improve, determine success, and track student progress. Assessment activities are conducted on a periodic and continual basis to evaluate the progress of student learning outcomes throughout the learning process. Assessment or evaluation activities can be used to identify student progress toward learning objectives.

Cycle II

Cycle II's learning activities were still divided into four stages: planning, implementing, observing, and reflecting. These are the four stages:

1. Planning stage a) Make a learning implementation plan. b) creating learning strategies and scenarios using TPACK. c) Identify achievement indicators for the success of the classroom learning process. d) assembling research instruments, such as assessment and observation sheets.
2. The action's implementation stage a) At the start of the activity, students are explained the learning objectives. b) Using the TPACK approach in classroom learning activities with laptops, projectors, Microsoft PowerPoint presentations that engage students, and learning videos. c) Students are given evaluation questions to complete as part of the assessment.
   The opening activity at the implementation stage begins with prayer, attendance, and perception of the previously completed subject matter. The teacher then asks the students a question, and they respond with their thoughts on how the tests should be organized. Students divide tests into groups based on what is in the previously dis-tributed learning implementation plan material. The following activity is carried out by displaying PPT slides, during which students are given an explanation of the material for the various types of tests. Several students gave presentations in front of the class, and the lecturer provided feedback. The activity concludes with a reflection on what was learned, concluding, and praying.
3. Observation Stage. The researcher observes data and information on the ongoing learning process at this stage to determine the suitability of the design and learning objectives. The evaluation is carried out to determine the achievement of student learning outcomes in learning activities.
4. Reflection stage. A reflection activity is a thorough examination of the previous actions. The researcher evaluates the analysis of student learning outcomes that have taken place during the reflection stage. Evaluation or assessment is a process that measures student competence in learning to improve, determine success, and track student progress. Assessment activities are conducted on a periodic and constant basis to assess the progress of student learning outcomes throughout the learning process. Assessment and evaluation activities can be used to detect student achievement in learning desired results.
   Using the TPACK approach, students appeared to be more enthusiastic, interested, and easy to understand the material presented in cycle II activities. The average student learning outcome is 85, indicating that all learning objectives have been reached. According to research conducted at Padang State University's Department of Sports Education, Faculty of Sports Science, learning using the TPACK scientific approach helps lecturers convey subject matter and creates a learning process that involves and improves student learning outcomes. Technological Pedagogical Content Knowledge (TPACK)is a framework for identifying knowledge, that is required for educators to teach with a technological framework efficiently. Mishra et al. (2016) define TPACK as a framework for understanding and describing the knowledge required by lecturers in streamlining pedagogical practices and understanding concepts through integrating technology in the learning

environment. The basic idea behind TPACK is that Mishra and Koehler first proposed TPACK in 2006. They discussed related to TPACK as an educator/designer framework for incorporating technology into learning. The TPACK concept appears in learning technology based on Shulman's pedagogy content knowledge (PCK) model. According to this definition, implementing the TPACK approach is one method for achieving learning objectives that can improve student learning outcomes in class. The incorporation of technology in learning is becoming increasingly important over time.

Learning media is an intermediary or delivery of messages from the giver to the recipient of the message (Arsyad in Damitri, Dea Elvina. 2020). In the learning process, media serves as a relationship regulator. Learning media is essential in the implementation of learning in the classroom to assist teachers in achieving learning objectives. Using Windows PowerPoint to convey thematic learning material is a fascinating learning medium. Media PowerPoint is an intriguing, interactive messenger that can motivate student learning in class.

In the learning process, using learning media can increase students' desire, interest, motivation, and psychological influence (Hamalik in Nurseto, Tejo. 2011). The role of technology is enormous in learning today, one of the examples is in the form of Microsoft PowerPoint. Microsoft PowerPoint learning media can display learning material more interesting, present text, pictures, films, songs, and animations to create strong understanding and memory and be used repeatedly. The first cycle did not go well because students were still adjusting to learning media in the form of PPT. Some students are still confused with the subject matter in the learning process. Students from the Department of Sports Education, Faculty of Sports Science, Padang State University, who took the Physical Education measurement and evaluation test course saw increased learning outcomes in the first cycle of teaching practice activities. Students began to understand the material by using learning media in the form of PPT slide shows. Student enthusiasm and activity increased, indicated by several students starting to ask questions in the learning activities process. Students are getting used to learning activities and achieving good categories.

CONCLUSIONS

The findings of this study indicate an improvement in student learning outcomes through TPACK-based learning using a learning management system. As a result, as demonstrated by this study, the TPACK learning model is an excellent learning solution. It is because, in addition to making it easier for lecturers to integrate technology with pedagogic content, the TPACK learning model makes students interested in participating in learning so that students understand the subject material given by the lecturer, which has a direct impact on increasing student learning outcomes. Improving student learning outcomes through the Android-based TPACK approach has a positive effect or impact, as evidenced by an increase from pre-cycle to cycle II. The completeness of student learning outcomes was 35% or 7 students out of 20 in the pre-cycle, 55% or 11 students out of 20 in cycle I, and 85% or 17 students out of 20 in cycle II. There was a 20% increase in learning outcomes from pre-cycle to cycle I and a 30% increase from cycle I to cycle II. As a result, the indicators of achievement and completeness have in-creased. As a result, the TPACK learning model based on the learning management system can be concluded to improve student learning outcomes in the Physical Education measurement and evaluation test subject at the Department of Sports Education. Re-searchers can make several recommendations based on the conclusions presented above. Student learning outcomes in Higher Education have improved due to the use of the TPACK model; however, it is necessary to socialize it so that it can be applied to other sections of the subject.

The TPACK model used in this study, which is based on a learning management system, can be used by lecturers to increase innovation in lectures while also increasing their ability to use IT in the learning process. Furthermore, because students currently studying are from the millennial and Z generations, born in a technologically sophisticated era, the TPACK model based on the learning management system can capture their attention. Thus, with the TPACK learning model based on this learning management system, students can listen to learning through videos and material in each student's e-learning and lectures delivered by lecturers. Students should be even more motivated to participate actively in learning with the

Android-based TPACK learning model. More research is required for researchers because the results of this study were only conducted in one class and one course. Educational practitioners or other researchers can use this research as a reference material for conducting other research with the same learning approach in different subjects so that various alternative innovations in learning activities are obtained, allowing the semester learning objectives stated in the semester learning implementation plan to be realized following the learning outcomes of each course.

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