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ABSTRACT

The main objective of this study is to develop and standardize an instrument of pedagogical and professional competency for Physical Education teachers at elementary school level. Based on Law No. 14 of 2002, teachers in Indonesia are required to master four competencies, namely: pedagogy, professional, personality and social. Currently, there are only few numbers of standardized instruments to test these four competencies. Thus, this study aims at developing and standardizing a pedagogical and professional competency instrument in a form of a test. This study applied a procedural research and development (RnD) model using the following steps: research and collection preliminary, research planning, early product development, expert validation, product revision, early test, product revision, field test, final product revision and mass product manufacture. The test subjects in this study were physical education teachers at the elementary school level. Based on data from Education Authorites in Padang, the total population in this study was 480 people and the sample was taken purposively. During the early test, it was carried out to 20 samples and during the field test, it was carried out on 20% of the total population, namely 84 people. Standardization of the instrument was carried out by conducting several analysis, namely: validity, reliability, item difficulty level, item discriminating power, practicality test, and effectiveness. Data were processed using IBM SPSS statistical program with $p < 0.05$. Based on the results of processing and processing, a standardized instrument that can measure pedagogical and professional competence for Physical Education teachers was successfully made.

Keywords: Pedagogical and professional competence, physical education teachers

Introduction

Teachers are essentially strategic components in efforts to advance education. According to Usman, (1992) "the presence of a teacher is a *condisio sine quanon* factor that cannot be replaced by any components, especially in this current contemporary era". This explanation illustrates that teachers own essential roles in the life of a nation and state. Physical education at the elementary school level is a very important basis for education. At this level, physical education is a very decisive foundation for physical development from childhood to adulthood. If physical education at this level is successfully implemented, it will positively contribute for students' optimal development in the long run.

To be able to carry out this vital role, the Law of the Republic of Indonesia number 14 of 2005 requires the teachers to have various basic competencies, namely pedagogic al competence, personality competence, social competence, and professional competence. The educational process that takes place in schools will run well if it is carried out by teachers owning these four competencies. The basic definition of competency is the ability or proficiency. Gudmundsdottir & Shulman, (1987) argue that teachers' competence as "… descriptive of qualitative nature of teacher behavior appears to be entirely meaningfull…'

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According to (Usman, 1992) competence is "a thing that describes a person's qualifications or abilities, both qualitative and quantitative".

Teacher's competences are defined as personal characteristics, integrated knowledge, skills, and attitudes as the absolute requirements for optimal performance in the realm of teaching (Arifin et al., 2018; Stoof et al., 2002; Tigelaar et al., 2004). Performance theory is the basic concept for competence. By using the theory of basic competence, maximum performance is believed to occur when the person's abilities match the needs of the job (Boyatzis, 1982). It is one's abilities which are explained by personal philosophy, vision, values; knowledge; competence; stage of life and career; styles and interests (Arifin et al., 2018).

Based on the concept of competence, teacher's competences is divided into four domains, namely; (1) pedagogical knowledge (2) professional subject matter content knowledge, (3) personality knowledge, (4) social knowledge (Gudmundsdottir & Shulman, 1987). The first domain in the measurement framework requires the ability of teachers to integrate theory and practice in classroom activities ((Diep & Hartmann, 2016; Salyakhova & Valeeva, 2015). In this case, physical education teachers must be able to design teaching and learning objectives (Loewenberg Ball et al., 2008). Considering this, physical education teachers need to use different teaching techniques and use a practical approach to reflect the teaching objectives.

Hence, it can be seen that competences can be interpreted as performance in doing something that is obtained through education. Teacher's competences are the application of rational performance and action, to meet special specifications in carrying out educational activities. According to Mulyasa, (2007:26). As the main component, competence is the basis for meeting the standards of the teaching profession. Teacher competence is a combination of personal, social, technological, and spiritual performance that kaffah forms the standard competence of the teacher profession, which includes educational learning, material mastery, understanding of students, personal development and professionalism.

From the explanation above, it can be concluded that pedagogical competence is a specific competence which distinguish teachers from other fields of work/profession. Besides, it is a determining factor in achieving the success of the learning process and outcomes of their students. This competency does not just appear automatically, but is obtained through continuous learning, which is carried out by the teacher throughout his career as an educator.

According to (Antera, 2021; Salyakhova & Valeeva, 2015), professional competence is the ability to master learning materials broadly and deeply that allows guiding students comprehensively. Teachers as a profession should meet the following professional criteria, namely: the ability to emphasize on a particular skill and field according to their profession, to perform skills based on in-depth scientific concepts and theories, to fulfill adequate level of education, to have sensitivity to society and to develop themselves in harmony with the dynamics of life (Bienzobas & Barderas, 2010; Hrastinski, 2021).

The purpose of developing an instrument is to provide standardized instruments. A standard instrument can be obtained through several development processes based on experience and authentic facts through several stages of analysis. Ebel and Frisbie (1991:286) state that standardized tests are tests that are planned and designed by experts, tested for several times, are analyzed deeply, and revised based on previous analysis. The instrument must be equipped with information on how to administer and to evaluate it as well. In other words, it is confirmed that the standardization process involves making, testing, revising and administrating and scoring guidelines.

Teacher Competency Test (UKG) is a series of activities aimed at assessing mastery of the material as well as learning methods or strategies in the subjects that are fostered at a certain level of education. UKG is also a prerequisite for teachers to teach. The development and

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standardization of competency test tools refers to the Teacher Competency Standards issued by the Ministry of National Education. The purpose of development in this study is to develop an instrument for testing the competence of Physical Education teachers at the elementary school level in Padang. Through the development of a competency test instrument model for physical education teachers, it is expected to produce a test tool to see the competence of physical education teachers at the elementary school level. This competency test can also be used as an alternative tool for teacher acceptance tests, especially to measure the competence of the selected physical education teachers.

With the birth of this instrument, it is hoped that it can become an alternative competency test for teachers or prospective teachers of health sports physical education. The instrument was created and developed and then tested for its validity and reliability, so that it will be a valid and reliable standardized instrument for evaluation system to measure the competence of teachers or prospective teachers of physical education in sports health in elementary schools.

Method

This research employed research and development (R&D) model. R&D is a systematic study of design, development and evaluation processes with the aim of establishing an empirical basis for the creation of instructional and non-instructional products and tools and new or enhanced models that govern their development (Richey and Kein, 2007) . This study uses a procedural model, and adopts the procedure developed by Sugiono (2007:298), which contains: (1). Potential and Problems, (2). Data Collection, (3). Product Design, (4). Design Validation, (5). Trial of Use, (6). Product Revision, (7). Product Trial, (8). Design Revision, (9). Product Revision, (10) Mass Production.

The trial subjects in this study were elementary school teachers inPadang, which were carried out twice, namely an early trial of 20 samples and a field trial of 20% of the total 420 people, namely 84 people.

The procedure for developing the competency test instrument for the Elementary school Physical Education teachers was grouped into three (3) stages. The first stage is designing the items of the instrument. The second stage is testing the theoretical validity through expert judgment. The third stage is testing the construct validity, reliability, practicality test, and empirical effectiveness test.

The research instrument that was developed and standardized is an instrument in the form of a test which was designed to test the pedagogical and professional competence of the Physical Education teachers in Padang. This is because pedagogical and professional competencies are the knowledge, skills, and abilities possessed by teachers so that they can perform cognitive, affective and psychomotor behaviors. Thus, the right instrument to measure this competence is through tests. According to Arikunto (2004) the instrument consists of two types, namely instruments in the form of tests and non-tests. Standardized tests are used in observing a person's behavior, as well as describing this behavior with the help of a number scale or a classification system. Included in this group of tests are learning achievement tests, intelligence tests, aptitude tests or academic ability tests.

Descriptive statistical analysis aims at describing the general level of assessment of the compiled instrument. Furthermore, the construct validity test was determined by analyzing the average score of five expert judgments. The analysis was carried out by analyzing the average difference between the five expert judgments. Internal consistency was measured by Cronbach's alpha (Nunnally, 1978). Cronbach's alpha ranging from 0.6 - 0.7 iss considered to indicate acceptable internal consistency, 0.7 - 0.9 is considered good for internal consistency and > 0.90

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is regarded as very good internal consistency (George, D., & Mallery et al., 2003). To make the standard instrument, the process was continued by:

1) Validity and reliability test which relates to the extent to which the measuring instrument is able to measure what it is supposed to measure.
2) Practicality of the instrument test, which relates to the extent to which the practicality of the instrument made.
3) Effectiveness of the instrument test, which relates to the extent to which the efficiency of the instrument made (Cury et al., 2019; Kane, 2013).

All data were analyzed using IBM SPSS software and significance was determined at the level of $p < 0.05$.

Discussion

This instrument was developed by testing the construct validity between; dimensions and core competencies, core competencies and indicators, and indicators with items, reliability, level of difficulty and discriminating power. Furthermore, this instrument was standardized through practicality and effectiveness tests.

Table 1. Overview of the pedagogical and professional competency test instruments developed for physical education teachers

Competence	**Sub-competence and indicators**
Pedagogical Competence Knowing students' physical, moral, spiritual, social, cultural, emotional and intellectual characteristics	Analyzing the characteristics of students which relates to physical, intellectual, social, emotional, moral, spiritual and socio-cultural background aspects • Explaining the students' characteristics related to physical, intellectual, social, emotional, moral, spiritual and socio-cultural aspects • Analyzing t the students' characteristics related to physical, intellectual, social, emotional, moral, spiritual and socio-cultural backgrounds Analyzing students' initial learning in physical education subjects • Analyzing students' schedules in physical education subjects Analyzing learning difficulties for physical education students • Identifying students' learning difficulties in physical education subjects • • Analyzing the learning difficulties of students in physical education subjects
Mastering learning theory and learning principles	Analyzing various learning theories and educational learning principles related to physical education subjects • Analyzing learning theories in physical education • Explaining learning theories in physical education

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	• Choose a learning theory in physical education that is in accordance with the growth and development of students . Analyzing various approaches, strategies, methods, learning techniques that educate creatively in physical education subjects • Explain various approaches, strategies, methods, learning techniques that educate creatively in physical education and physical education • Applying various approaches, strategies, methods, learning techniques that educate creatively in physical and physical education in accordance with the education unit • • Choose various approaches, strategies, methods, learning techniques that educate creatively in presenting the material
Develop a curriculum related to physical education subjects	Analyzing the principles of curriculum development • Explain the principles of curriculum development Develop a curriculum related to physical education subjects • Identifying the legal basis for curriculum development • • Analyzing the principles and foundations of curriculum development in accordance with the education unit
Organizing educational learning	Analyzing the principles of educating learning design • Identify the juridical basis for the preparation of the Lesson Plan (RPP) • Explain the basic concepts of RPP preparation; understanding, components, principles, and preparation steps • • Identifying Minimum criteria (KKM) based on competency characteristics
Organizing assessment and evaluation of learning processes and outcomes	Analyzing the principles of assessment and evaluation of learning processes and outcomes in accordance with the characteristics of Physical Education • Explain the concept of test, measurement, assessment, and evaluation of learning outcomes • Explain the types, forms, and techniques of tests and non-tests in assessment • • Identify the types, forms, and techniques of tests and non-tests in assessment
Professional Competence	
Mastering the material, structure, concept, and scientific mindset that supports physical education subjects	Explain the philosophical dimensions of physical education including ethics as a rule and a profession • Explain the meaning of physical education, sports education and health education • Explain the philosophical foundations of physical education, sports education and health education

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	• Analyze the differences and similarities of physical education, sports education and health education • Implementing the functions and benefits of physical education, sports education and health education in school learning Analyzing movement development and learning movement of students • Explain the concepts of development and movement learning; • Explain the stages of motor development and learning • Applying the principles of motor development and learning in conducting physical education learning Choose activities in the development of basic movement patterns • Explain the basic concepts of basic movement patterns • Perform basic movement patterns in learning • Evaluate learning materials to develop basic movement patterns Choosing learning materials within the scope of games and sports activities • Explain the concept of game and sport activities • Identify the types of activities within the scope of games and sports • Perform various basic skills in the scope of game and sports activities • Evaluating learning materials in the scope of games and sports activities Choosing learning materials within the scope of fitness development activities • Identify elements of fitness development activities • Identify types of fitness development activities Choosing health learning materials • Explain the concept of health • Identify health materials • • Evaluating health learning materials
Mastering competency standards and basic competencies of subjects/fields of development that are taught	Understand the competency standards of the subjects taught • Identifying the juridical basis for competency standards for physical education subjects • Analyzing the scope/strand of physical education subjects Understanding the basic competencies of the subjects taught • Identify the basic competencies of physical education subjects • • Mapping the basic competencies of physical education based on the scope, domain, and gradation

Developing physical education learning materials creatively	Processing the subject matter that is taught creatively according to the level of development of students • Explain the principles and procedures for modifying learning materials • • Modify learning materials according to the character of students
Develop professionalism in a sustainable manner by taking reflective actions	Continually reflecting on your own performance • Explain the professional competence of teachers Conduct classroom action research for professional improvement • Explain the basic concepts of Scientific Writing; principles, types, characteristics, and criteria • • Explain the principles, types, characteristics, and criteria of Classroom Action Research
Mastering the material, structure, concept, and scientific mindset that supports physical education subjects	Analyzing the psychological symptoms of students • Identify various psychological symptoms of students • • Analyze the psychological symptoms of students and their psychology

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Table 1 describes the competencies and sub-competencies of the pedagogic and professional competency test instruments that have been developed. Furthermore, the validity and reliability and practicality of the instrument were tested so that the instrument is standardized for widespread use.

Table 2. Test of Validity and Reliability Instruments for PhysicalEducation Teachers, Pedagogical and Proffesional Copetence

Competence	*Expert judgment*	Interrater Validity	Description	Cronbach's Alpha	Description	Praktikalitas
Pedagogical Competence						
Mastering the characteristics of students from the physical, moral, spiritual, social, cultural, emotional and intellectual aspects	Content & Language	0,8	Valid		Reliable	
Mastering learning theory and learning principles	Content & Language	0,8	Valid		Reliable	
Develop a curriculum related to physical education subjects	Content & Language	0,8	Valid	0,811	Reliable	84,56 (Practical)
Organizing educational learning	Content & Language	0,8	Valid		Reliable	
Organizing assessment and evaluation of learning processes and outcomes	Content & Language	0,8	Valid		Reliable	
Professional Competence						
Mastering the material, structure, concept, and scientific mindset that supports physical education subjects	Content & Language	0,8	Valid		Reliable	
Mastering competency standards and basic competencies in subjects/fields of development that are taught	Content & Language	0,8	Valid		Reliable	
Developing physical education learning materials creatively	Content & Language	0,8	Valid	0,877	Reliable	82,11 (Practical)
Develop professionalism in a sustainable manner by taking reflective actions	Content & Language	0,8	Valid		Reliable	
Mastering the material, structure, concept, and scientific mindset that supports physical education subjects	Content & Language	0,8	Valid		Reliable	

Validity carried out by experts has a median value of being in the good category. To find the level of reliability of the developed instrument, it is calculated using the inter-rater reliability (interrater). The results of calculations using SPSS show that the personality and social competence test instrument for physical education teachers, has a reliable coefficient value of Cronbach's Alpha of 0.811 which is in the high category with a practicality level of 84.56 very practical for pedagogic competence and 0.877 is in the high category with a practicality level of 82, 11 very practical for professional competence

Table 3. Interpretation of the effectiveness of the pedagogical and professional competence test instrument developed for physical education teachers

Competency	Pedagogical Competence					Professional competence					p-value
	KP1 (M ± SD)	KP2 (M ± SD)	KP3 (M ± SD)	KP4 (M ± SD)	KP5 (M ± SD)	KP1 (M ± SD)	KP2 (M± SD)	KP3 (M± SD)	KP4 (M ± SD)	KP5 (M ± SD)	
Pedagogical Competence											
Mastering students' physical, moral, spiritual, social, cultural, emotional and intellectual aspects characteristics (KP1)	74,73±7,434	75,72±6,434	73,72±6,640	76,72±7,434	76,72±7,434	75,3±7,112	73,72±7,434	83,11±7,434	73,72±7,434	83,72±7,434	0,001**
Mastering learning theory and learning principles (KP2)	71,25±6,560	73,44±6,560	75,28±6,403	78,2 ± 6,560	75,28±6,360	76,35±6,234	71,28±6,560	83,98±6,560	85,28±6,560	78,28±7,560	0,000*
Developing a curriculum related to physical education subjects (KP3)	76,23±7,051	71,28±6,44	78,22±7,044	88,22±7,441	72,22±7,021	72,22±7,001	71,22±7,051	84,22±7,011	72,22±7,077	72,22±7,331	0,001**
Organizing educational learning (KP4)	76,00±7,406	74,00±7,412	74,00±6,404	74,00±6,306	74,00±7,623	71,00±6,921	74,00±7,406	88,00±7,306	74,00±7,406	74,00±7,406	0,003**
Organizing assessment and evaluation of learning processes and outcomes (KP5)	76,00±7,406	73,44±6,560	75,45 ± 6,43	74,73±7,434	75,72±6,434	78,99±6,001	71,28±6,522	75,28±6,560	75,28±6,560	75,18±7,860	0,001**
Professional Competence											
Mastering the material, structure, concept, and scientific mindset that supports physical education subjects (KP1)	83,72±7,434	78,72±7,434	75,52±7,434	73,72±7,434	73,55 ± 7,12	73,72±7,400	73,72±7,434	8172 ±7,434	73,72±7,434	82,72±7,434	0,000**
Mastering competency standards and basic competencies of subjects/fields of competent development (KP2)	78,99±6,001	71,28±6,522	75,28±6,560	75,28±6,560	71,25±6,51	75,28±6,560	75,28±6,560	83,26±7,523	82,28±7,560	75,28±7,560	0,000**
Developing physical and physical education learning materials creatively (KP3)	71,22±6,233	73,22±7,341	72,22±7,122	72,22±7110	78,27±7,226	72,22±7,051	72,22±7,021	83,23±7,054	72,22±7,051	82,22±7,051	0,005**
Develop professionalism in a sustainable manner by taking reflective actions (KP4)	72,00±7,442	74,00±6,533	74,00±7,009	74,00±7,435	74,00±7,451	74,00±7,306	74,00±7,506	74,81±7,522	74,00±7,406	74,00±7,406	0,002**
Mastering the materials, structures, concepts, and scientific mindsets that support physical education subjects (KP5)	72,28±6,560	72,67±7,510	78,28±6,560	72,33±6,521	77,28 ± 6,40	78,28±6,231	74,2 ± 7,228	85,28±7,341	86,35±7,234	76,72±7,433	0,000**

The final measurement data in Table 3 shows that the univariate analysis of difference (ANOVA) based on coefficient of influence -t and the value of the statistical significance of the p-value proves that there is a statistically significant difference between the experiments p= 0.000. The interpretation of the significance value of 0.000 is smaller than alpha (0.000 < 0.005) which means that there is a significant difference which can be interpreted as very effective.

The effectiveness of the pedagogic and professional competency test instruments for physical education teachers was described based on expert judgment, validity, reliability, and practicality tests of pedagogical and professional competence instruments using Multivariate Analysis of Variants. The results showed that the instrument could be used by the government as a solution to assess the competence of prospective elementary school physical education teachers (Dewi, 2021; Eka Tuah et al., 2021; Kartowagiran et al., 2020; Yanova et al., 2021).

Knowing the competence of prospective physical education teachers is very important, because the competence of a teacher is an integral part in determining the quality of education (Bouley et al., 2015; Siri et al., 2020). Against the backdrop of a changing world, the increasing demands on knowledge and competencies require empirical educational research, especially research on competency measurement (Adnan et al., 2019; Carnoy, 2014). Several studies have addressed teacher competency tests in general, such as pedagogic and professional competency tests (Cechova et al., 2015; Huijbers et al., 2017; Tang et al., 2017; Wathani, 2020). Compared to other instruments for testing pedagogical and professional competencies in general, we provide specifically an instrument that was developed, namely to test the competence of elementary school physical education teachers.

The results found that the instrument developed made a significant contribution to the measurement of the pedagogic and professional competencies of physical education teachers. This finding confirms that the instrument that has been developed is more valid, reliable, practical and effective to measure the pedagogical and professional competence of elementary school physical education teachers, compared to the previous instruments which are general in all fields of study. The instrument that has been developed considers that physical education teachers and students build content knowledge related to general pedagogical knowledge and context knowledge through direct experience, professional dialogue with practitioners, and practical observations (Chiang & Trezise, 2021; Cury et al., 2019; Fonsén & Ukkonen-Mikkola, 2019; Tang et al., 2017). Therefore, the pedagogical and professional competency test instruments for elementary school physical education teachers that have been developed can be used to test the pedagogical and professional competencies for Physical Education teachers.

Conclusion

The purpose of this study was to develop and standardize an instrument to test the Pedagogic and Professional Competencies of Physical Education teachers. Through various procedures and stages that have been carried out, a standard instrument (test tool) is finally constructed that can be used to test the two competencies in form of questions. The results of this study provide an alternative for users, namely schools and the Regional Education Office, which aims to test the pedagogical and social competencies of Physical Education teachers.

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