**Research Article**

# TPACK Competency Analysis of Prospective Physics Teachers Using CoRe Instruments

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**Abstract.**
This study aims to determine the TPACK competence of prospective physics teachers based on the suitability of CoRe with lesson plans and the value of preparing lesson plans. The research method used is descriptive qualitative. This method is used to provide an overview of the subject under study. The subjects studied were 12 prospective physics teachers who took the micro teaching even semester academic year 2021 program at the Department of Physics Education at Sunan Gunung Djati State Islamic University, Bandung. The instruments used are of course the CoRe sheet, lesson plans, and assessment sheet of lesson plans. The lesson plans that are seen as analysis are uniformly accelerated motion, parabolic motion, work and energy. From the results of the study, it was shown that the prospective who compiled the lesson plans of uniformly accelerated motion is 76.5% (good), parabolic motion is 66% (medium), and work and energy is 78% (good). As for the value of the preparation of the lesson plans, each received a score of 75.0 (enough). A good and correct lesson plan is to include all components so that later during the learning process the teacher can refer to the lesson plans that have been prepared previously.

**Keywords:** TPACK, CoRe instruments

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# 1. INTRODUCTION

The 21st century or the century of globalization is a century where the order of human life undergoes changes that are different from the previous century. In the 21st century, information and communication technology is growing faster [1]. This change in the way of life causes every society to transform from ordinary life to technological life or digital transformation. Digital transformation does not only exist in one sector of life but has also penetrated the world of education. According to Syahputra (2018), in the 21st century, teachers and students must be literate in digital technology [2]. Therefore, every teacher must have qualified competence. These competencies must meet the Standards of Educators and Education Personnel as stated in PP No. 19 of 2005 consisting of

pedagogic competence, professional competence, social competence, and personality competence [3].

Professional teachers must have TPACK competence. Because TPACK competencies are in the realm of 4 competencies that must be mastered by teachers [4]. Teachers' TPACK can be seen based on the CoRe (Content Representation) and PaP-eRs instruments [5]. The CoRe instrument is a description of the concept of the subject matter that will be taught by the teacher while the PaP-eRs is a short narrative written by the teacher and tends to be specific to show the implementation of CoRe aspects [6].

Teachers' TPACK competencies must be applied to the learning process. A good learning process involves students being active to achieve learning objectives [7]. This applies to all subjects including Physics subjects. Physics learning has the aim of increasing students' thinking skills in terms of psychomotor, cognitive, and proficiency in thinking systematically, objectively, and creatively [8]. To meet these demands, the learning process requires the participation of teachers who must be creative and innovative in preparing learning tools such as lesson plans.

However, in reality, there are still difficulties felt by prospective teachers in preparing lesson plans. So far, they have compiled the lesson plans not based on CoRe. This is because they have never experienced direct learning. So, in preparing the lesson plans, they compile it based on the direction of the theory, course lecturers, and curriculum.

One of the efforts that can be done is that student-teacher candidates in higher education must learn to make and develop good learning tools through Micro Teaching courses. The TPACK competence of a teacher is very important because it is an initial description of pedagogic competence, mastery of content (material), and technology for prospective teachers before carrying out real teaching or actual learning in schools [4]. This means that TPACK cannot be separated from the ability to compose learning tools. According to Harris & Hofer (2011), a teacher's TPACK is reflected in the learning tools that are prepared [9]. According to Sholihah & Yuliati (2016), a prospective physics teacher who has high TPACK competence will have the ability to develop good learning tools [10]. Learning tools play an important role in the implementation of teaching and learning activities.

This is following research conducted by Rosdiana et al. (2017) guided discovery-based learning devices can improve student learning outcomes [11]. This study aims to analyze the TPACK competence of prospective teachers by looking at the suitability of the ideal CoRe and lesson plans made by prospective teachers and knowing the value of preparing lesson plans. The reason for only using the CoRe instrument is because it is limited by researchers who are both prospective teachers so they cannot assess

learning. After the TPACK competency level is known, then the teacher can improve and develop his competence so that he can complete the learning process well.

## 2. METHOD

The method used in this research is descriptive qualitative. According to Mulhayatiah et al (2021), this method is used to describe a symptom, event, and event that is happening now [6]. The subjects in this study were 12 prospective Physics teachers who took the Micro Teaching course program in the Even Semester of the 2021 Academic Year at the Department of Physics Education at Sunan Gunung Djati State Islamic University, Bandung. This sampling is based on the theory of Gay and Diehl (1992) that when the research condition is a descriptive study, the number of samples must be 20% of the 60 population.

The instruments in this study were the ideal CoRe sheet, lesson plans, and lesson plans assessment sheets. The ideal CoRe sheet is designed to refer to the CoRe sheet. The research data was taken by looking at the suitability between the ideal CoRe sheet and the lesson plans made by prospective teachers and looking at the evaluation of the lesson plans based on the assessment sheets for the preparation of the lesson plans. To determine the percentage of conformity of CoRe and lesson plans the researcher assigns a score to each indicator of the suitability of CoRe with lesson plans and then calculates the percentage using equation (1).

$$\text{Percentage} = \frac{(Score\ obtained)}{(maximum\ score\ )} \times 100\% \quad (1)$$

The lesson plans assessment sheet instrument is used to see the results of the extent to which teachers can prepare lesson plans well.

## 3. RESULT AND DISCUSSION

The results obtained in this study are the TPACK competency analysis of prospective teachers. Physics material that is outlined in the lesson plan includes uniformly accelerated motion, Parabolic Motion, and Work & Energy. Documentation of the learning implementation plan can be seen in Figures 1, 2, and 3.

### 3.1. Compatibility of CoRe Sheet and Lesson Plans

**Figure** 1: Lesson plans of uniformly accelerated motion.

### 3.1.1. Compatibility of CoRe Sheet with Lesson Plans of Uniformly Accelerated Motion

TABLE 1: Recapitulation of acquired percentage of conformity of core and lesson plans of uniformly accelerated motion.

| Pre-service teacher | Percentage | Interpretation |
|---|---|---|
| Prospective 1 | 75% | Currently |
| Prospective 2 | 78% | Well |
| Prospective 3 | 75% | Currently |
| Prospective 4 | 78% | Well |
| Average | 76.5% | Well |

### 3.1.2. Compatibility of CoRe Sheet with Lesson Plans of Parabolic Motion

### 3.1.3. Compatibility of CoRe Sheet with Lesson Plans of Work and Energy
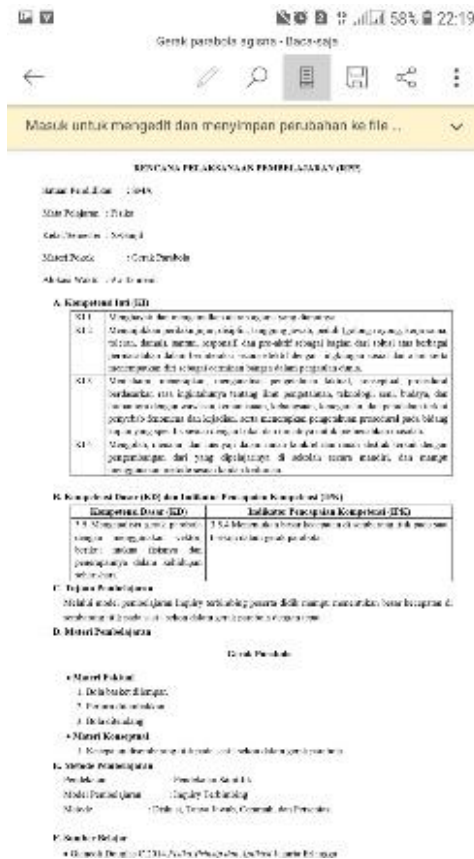
### 3.2. Lesson Plans Assessment

**Figure** 2: Lesson plans of parabolic motion.

TABLE 2: Recapitulation of acquired percentage of conformity of core and lesson plans of parabolic motion.

| Pre-service teacher | Percentage | Interpretation |
|---|---|---|
| Prospective 5 | 71% | Currently |
| Prospective 6 | 82% | Well |
| Prospective 7 | 69% | Currently |
| Prospective 8 | 53% | Very less |
| Average | 66% | Currently |

TABLE 3: Recapitulation of acquired percentage of conformance of core and lesson plans of work and energy.

| Pre-service teacher | Percentage | Interpretation |
|---|---|---|
| Prospective 9 | 62% | Currently |
| Prospective 10 | 84% | Well |
| Prospective 11 | 73% | Currently |
| Prospective 12 | 94% | Very good |
| Average | 78% | Well |

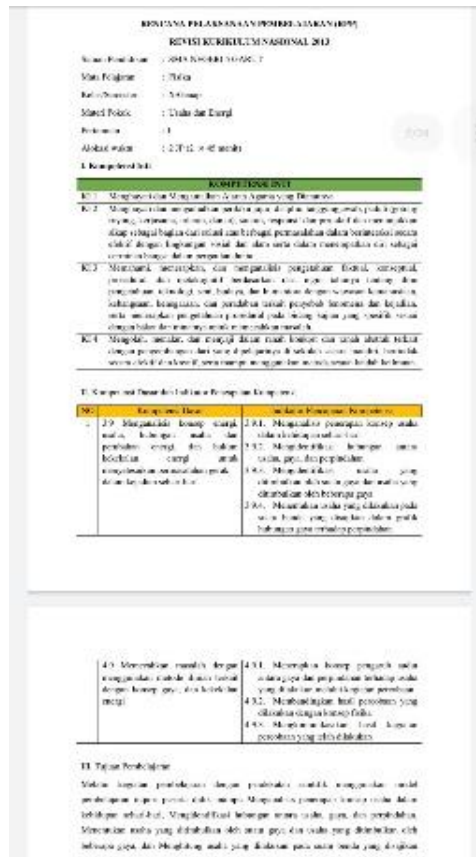### 3.2.1. Lesson Plans of Uniformly Accelerated Motion

**Figure** 3: Lesson plans of work and energy.

TABLE 4: Recapitulation of acquired lesson plans value for uniformly accelerated motion.

| Pre-service teacher | Mark | Interpretation |
|---|---|---|
| Prospective 1 | 71.8 | Enough |
| Prospective 2 | 67.1 | Not enough |
| Prospective 3 | 88.2 | Well |
| Prospective 4 | 65.9 | Not enough |
| Average | 73.25 | Enough |

### 3.2.2. Lesson Plans of Parabolic Motion

TABLE 5: Recapitulation of acquired lesson plans value for parabolic motion.

| Pre-service teacher | Mark | Interpretation |
|---|---|---|
| Prospective 5 | 76.5 | Enough |
| Prospective 6 | 74.1 | Enough |
| Prospective 7 | 63.5 | Not enough |
| Prospective 8 | 72.9 | Enough |
| Average | 71.75 | Enough |

### 3.2.3. Lesson Plans of Work and Energy

TABLE 6: Recapitulation of the Acquisition of Lesson Plans Value for Work and Energy.

| Pre-service teacher | Mark | Interpretation |
|---|---|---|
| Prospective 9 | 98.8 | Very good |
| Prospective 10 | 75.3 | Enough |
| Prospective 11 | 83.5 | Well |
| Prospective 12 | 63.5 | Not enough |
| Average | 80.27 | Well |

## 3.3. Discussion on the Suitability of CoRe Sheets and Lesson Plans

The suitability of CoRe and lesson plans for uniformly accelerated motion material compiled by 4 prospective teachers can be seen in Table 1. Overall, in the lesson plans compiled by prospective teachers, the average percentage of 76.5% is in the good category. Although 2 of the 4 prospective teachers are in the moderate category, all prospective teachers get a score of 4 for the aspect of using digital media. This indicates that prospective teachers can utilize technology in lesson plans of uniformly accelerated motion. This also means that prospective teachers have good TPACK competencies because they are based on the preparation of the lesson plans in uniformly accelerated motion by the answers to the ideal CoRe sheet. Developing lesson plans is very important because it is an integral part of complex learning activities [12].

The suitability of CoRe and lesson plans for Parabolic Motion material compiled by 4 prospective teachers can be seen in Table 2. In Table 2 it can be seen that only 1 teacher candidate is in the very poor category. While the rest are in the medium and good category. But overall, the lesson plans of Parabolic Motion compiled by prospective teachers get an average percentage of 66% in the medium category. Although 1 person out of 4 prospective teachers is in the very poor category, all prospective teachers get a score of 4 for the aspect of using digital media. This indicates that prospective teachers have been able to utilize technology in the Parabolic Action Plan. To be able to integrate technology into learning, a teacher or prospective teacher must have TPACK abilities [13].

The suitability of CoRe and lesson plans for Work & Energy materials compiled by 4 prospective teachers can be seen in Table 3. Overall, the lesson plans compiled by prospective teachers received an average percentage of 78% in the medium category. However, of all prospective teachers who compiled the lesson plans, only 1 teacher

candidate got a score of 2 for the aspect of using digital media so it did not match the answers on the CoRe sheet. For this reason, prospective teachers must increase the use of digital media in learning plans. The use of digital media in learning can improve student learning outcomes. Technology media is a supplement in classroom learning, so at this time teachers are expected to use technology in the classroom learning process [14–16]. TPACK plays an important role for a teacher and prospective teacher in the ability and creativity to develop lesson plans [17].

## 3.4. Lesson Plans Assessment Discussion

The results of the assessment of the lesson plans of uniformly accelerated motion material compiled by 4 prospective teachers can be seen in Table 5. In Table 5 it can be seen that there are only 2 prospective teachers who are in the less category. In preparing a lesson plan or lesson plan, it is very important to include the components of the completeness of the lesson plan because according to Cox (2017) learning plans can help teachers plan what will happen during class from time to time. In the lesson plan, the teacher can decide how the activities should take place in the learning [15, 16].

The results of the lesson plan assessment of the Parabolic Motion material compiled by 4 prospective teachers can be seen in Table 4. In Table 4 it can be seen that only 1 teacher candidate in the less category does not contain learning materials, there are no assessment components that are following the indicators and do not plan remedial and enrichment.

The results of the lesson plan assessment for the Work and Energy material compiled by 4 prospective teachers can be seen in Table 5. In Table 5 it can be seen that there is only 1 teacher candidate who is in the lesser category because it does not contain learning materials, there are no assessment components that are following the indicators, and they do not plan for remedial and enrichment.

A good and correct lesson plan is to include all components so that later during the learning process the teacher can refer to the lesson plans that have been prepared previously. When the teacher applies how to teach using lesson plans, the learning process will be effective and conducive to instructional factors to determine the success of the learning process by integrating with technology.

# 4. CONCLUSION

The analysis of the TPACK competence of prospective Physics teachers in Micro Teaching courses is seen from the suitability of CoRe and lesson plans including the compatibility between the lesson plans of uniformly accelerated motion compiled by 4 prospective teachers with the answers on the ideal CoRe sheet. The average percentage of conformity of uniformly accelerated motion lesson plans with CoRe is 76.5% in the good category. While the value of the preparation of the lesson plans of uniformly accelerated motion is in the sufficient category because it obtains an average value of 73.5. There is a match between the lesson plans of Parabolic Motion compiled by 4 prospective teachers and the answers on the ideal CoRe sheet. The average percentage of conformity of the Lesson Plan with CoRe is 66% in the medium category. While the value of the preparation of the lesson plans of Parabolic Motion is in the sufficient category because it obtains an average value of 71.75. There is a match between the lesson plans of Work and Energy compiled by 4 prospective teachers with answers on the ideal CoRe sheet. The average percentage of conformity between the lesson plans and CoRe is 78% with a good category. Meanwhile, the value of the preparation of the lesson plans for Work and Energy is in a good category because it has a score of 80.27.

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