Journal Homepage: https://journal.unesa.ac.id/index.php/jepk
Jurnal Ekonomi Pendidikan dan Kewirausahaan Vol. 13 No. 1 p207-226
p-ISSN 2303-324X, e-ISSN 2579-387X

STRATEGY OF TEACHER'S TPACK COMPETENCIES IN ECONOMICS EDUCATION

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ABSTRACT

The urgency of this research is motivated by the urgent need for teachers' Technological Pedagogical Content Knowledge competency related to the rapid advancement of information technology, which affects the efficiency and effectiveness of the learning process and the development of student characteristics holistically. Therefore, this study aims to develop the TPACK-IDD IRR method to improve teachers' TPACK competency and evaluate the contribution of this method in improving each TPACK domain. The research method is design based research, focusing on the design, development, and evaluation of educational interventions. The stages of model development are applied to the ADDIE development model. The implementation of TPACK IDD IRR consists of the stages of Introduction, Demonstration, Development, Implementation, Reflection, and Revision. The sample size consists of 120 pre-service teachers in the field of economics. Data collection techniques by observation and survey with observation guide instruments and questionnaires. The collected data were analyzed with descriptive statistics. The effectiveness of the model uses a one-sample t-test to identify differences in TPACK domain scores before and after the implementation of the IDD IRR strategy. The results of the study indicate that the IDD IRR model, which integrates discussion, simulation, and project-based learning methods, positively influences the TPACK competency of economics teachers. Ultimately, this study concludes that the IDD IRR strategy effectively enhances the TPACK competency of prospective economics educators, preparing them to face the challenges of modern teaching.
***Keywords**: Financial Literacy, Economic Decision-Making, Financial Knowledge, Financial Skills, Self-Confidence*

INTRODUCTION

Technological Pedagogical and Content Knowledge (TPACK) can be defined as the knowledge that teachers possess regarding the facilitation of

student learning of specific content through pedagogic and technological approaches (Cox & Graham, 2009; Koh et al., 2015; Voogt et al., 2013). TPACK represents a further development of Shulman's (1986) Pedagogical Content Knowledge (PCK) concept. TPACK is a learning model that integrates three main aspects: technology, pedagogy, and content. Khoehler & Mishra (2009: 62) posit that quality learning necessitates a sophisticated, interwoven comprehension of the three principal sources of knowledge: technology, pedagogy, and content, as well as their applications within contextual frameworks (Aluko & Ooko, 2022). The imperative to enhance the proficiency of economics educators in TPACK is driven by the imperative to adapt to the 4.0 industrial revolution in the field of education, the necessity to attain mastery of 21st-century skills.

The perspective is in line with Shulman (1986), who sees teachers as people who are able to integrate domain knowledge with appropriate pedagogical approaches so that students can better understand the subject matter. However, in reality, teachers' TPACK abilities are still relatively low and undeveloped, and teachers still have obstacles in implementing learning using technology-based media (Nurhayani et al., 2021; Santos et al., 2023; Semma et al., 2024). Based on Jordan 2014 which states that there is a high rate of teacher enrollment in online education programs but only 6.5% complete them. In addition to all low and all high groups, this clustering resulted in a group with low TK, one with low CK, and one with low PK (Valtonen et al., 2020).

Based on this, it is necessary to develop PST's TPACK competence. The TPACK development model consists of the SQD, TPACK- COPR, TPACK-IDDIRR, TPACK-COIR (Aqib et al., 2023; Zhang & Tang, 2021) and SAMR (Alivi, 2019; Kriek, 2016). Among these models, TPACK IDD IRR is more oriented towards development with training techniques (Kurniawati et al., 2019). The lack of longitudinal research showing how teachers use the current TPACK models—like SQD and TPACK-COPR—in their day-to-day work is one of their major shortcomings. The dynamic character of economic theories and practices necessitates constant adaptation and integration of technological, pedagogical, and subject knowledge, making this gap especially pertinent in the context of economics education. Another limitation is that the existing TPACK models predominantly focus on basic and higher education without addressing the specific needs of specialized subjects like economics the development of the IDD IRR model is necessitated by the need for a more specialized and adaptable framework that addresses the unique challenges of economics education, which are not sufficiently covered by existing TPACK models (Moreno). Reason of using TPACK IDD IRR, because can enhance integration technology in classroom because IDD IRR emphasizes the interdiciplinary approach to design and develop educational technology into their teaching practices (Darsih et al., 2023). Beside that, IDD IRR can improve continuos improvement through reflection. IRR strategy promote iterative reflective review, encouraging preservicr teacher to continously evaluate anf refine their teaching methods. This reflective practice help them identify areas for improvement, adapt to new educational challeges and stay

uploaded with latest technology advancement, ultimately enhancing their teaching competencies (Darsih et al., 2023; Durdu & Dag, 2017).

Previous researchers have asserted that the TPACK development model, when implemented as a training programme, is a widely used and more effective approach than other models (Koh & Chai, 2016) In light of the aforementioned evidence, the development strategy that has been implemented is that of TPACK IDD IRR. The model is frequently employed in the development of TPACK in the context of science and mathematics learning. Economics education, compared to other subjects, demands a unique approach to TPACK development because of 1) Economics education requires a unique approach to TPACK development due to its inherently interdiciplinary nature, which combine elemen of mathematics, social sciences, and humanities (Koehler & Mishra, 2005; Pamuk, 2012) the content of in economics is dynamic and constantly evolving, influenced by global economic changes and technological advancements. This necessitates a continue update of both content knowldge and technological tools used in traching (Harris & Hofer, 2011; Jang & Tsai, 2012). 3) Economics education places a strong emphasis on developing students' critical thinking and problem-solving skills. The TPACK model facilitates this by integrating technology that can stimulate real-world economic scenarios, allowing student to engage in experiental learning (Harris & Hofer, 2011; Pamuk, 2012).

This research presents a novel approach to developing TPACK in the field of economics, a social science discipline. Additionally, it introduces a new set of evaluation tools for the TPACK-IDD IRR development model. TPACK IDD IRR was TPACK approach which emphasizes the integration of technology, pedagogy, and content knowledge through interdisciplinary collaboration and design (Ariyanto, & Muslim, 2019). It aims to create innovative educational solutions that enhance teaching and learning experiences. This strategy also involves a continuous cycle of reflection and improvement, where educators regularly evaluate and refine their teaching practices based on feedback and new insights. It encourages a proactive approach to professional development and helps teachers stay updated with the latest educational trends and technologie (Durdu & Dag, 2017; Koehler & Mishra, 2005).

The research question, therefore, is whether the IDD IRR TPACK strategy can enhance Preservice Teachers (PST's) TPACK proficiency and which TPACK domains are enhanced by the IDD IRR technique. This study aims to develop the TPACK-IDD IRR method to improve teachers' TPACK competency and evaluate the contribution of this method in improving each TPACK domain consisting of technological knowledge (TK), pedagogical knowledge (PK), content knowledge (CK), pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK). This research employed the ADDIE development methodology (Analysis, Design, Development, Implementation, and Evaluation) on 120 PSTs in economics.

TPACK IDD IRR is a strategy that can be used to improve the ability to integrate technology, pedagogy and scientific content in the classroom. This approach emphasizes the integration of technology, pedagogy, and content

knowledge through interdiciplinary callaboration and design. It aims to create innovative educational solutions and enhance teaching and learning experiences (Koehler & Mishra, 2005). This strategy invloves a continuous cycle of reflection and improvement, where educators regularly evaluate and refine their teaching practices based on feedback and new insight. It encourages a proactive approach to profesional development ad help teachers stay updates with latest educational trends and technologies (Durdu & Dag, 2017).

The application of TPACK skills in this study is based on the theory of TPACK competency development, which is informed by constructivist and productive pedagogy theories. The constructivist perspective emphasises that learning is an active process of building understanding and knowledge through a breadth of interaction and continuous learning, with technology playing a key role in this (Anastasha & Movitaria, 2020; Bayly-Castaneda et al., 2024; Behera, 2023; McCreath & Cuthbertson, 2005; Nino, 2023; Stylianides & Stylianides, 2006; Timotheou et al., 2023; Zhu & Atompag, 2023). Productive pedagogy is an educational approach that aims to develop skills and knowledge that can be directly applied in the real world or in the workplace. This approach prioritises learning that is practical, interactive, and pertinent to the requirements of the professional or everyday environment. The application of TPACK is expected to facilitate the acquisition of knowledge through collaboration and technology, while also providing opportunities for experiential learning (Alsharif & Atweh, 2012; Alton-Lee, 2007; Hayes & Mills, 2018; Mejia & Sargent, 2023). Research on TPACK includes efforts to improve TPACk competency in the classroom, as well as teacher efficacy in implementing TPACK in implementing TPACK

The TPACK approach is developed from the Pedagogy Content Knowledge (PCK) approach, first introduced by Shulman in 1986 Koehler & Mishra (2005) explained that there are seven domains of knowledge in TPCAK, namely (1) Content Knowledge (CK) is the teacher's knowledge of the subject matter to be studied or taught; (2) Technological Knowledge (TK) is the teacher's knowledge of technology that can support learning; (3) Pedagogical Knowledge (PK) is an in-depth knowledge of the processes and practices in delivering the material to be studied; (4) Pedagogical Content Knowledge (PCK) according to Shulman 1986 (in Koehler, 2014) is effective teaching that requires more than just the separation of understanding of content and pedagogy; (5) Technological Content Knowledge (TCK) is knowledge of how technology can create a new picture in the material knowledge of how technology can create a new picture in certain materials (Schmidt et al., 2014; Timotheou et al., 2023); (6) Technological Pedagogical Knowledge (TPK) is an understanding of how learning can change when certain technologies are used in certain ways; (7) Technological Pedagogocal Content Knowledge (TPCAK) is knowledge of the complex interactions between domains of knowledge principles (Koehler & Mishra, 2005).

RESEARCH METHOD

This paper presents a method for developing design research-based competencies. Design research is a systematic study of designing, developing, and evaluating educational interventions (such as programs, learning strategies, materials, products, and systems) to solve complex problems in education. The objective of this research is to advance our knowledge of the characteristics of these interventions and the process for design and development (Nugraha et al., 2017). Design-based research comprises a series of steps, including the educational design process, which encompasses analysis, design, evaluation, and revision. This cyclical process culminates in a balance between theoretical concepts and practical applications (Nugraha et al., 2017). The research procedure is broadly carried out in three stages, namely:1) Need assesment 2) Developing model 3) validating model. The needs assessment stage is carried out by assessing respondents' abilities in solving questions about the TPACK concept, assessing learning outcomes of courses related to digital learning, and assessing the availability of infrastructure. Design process employs the ADDIE model, which comprises the following five stages: analysis, design, development, implementation, and evaluation (Spatioti et al., 2022). The ADDIE steps are illustrated in Figure 1.

Participant

The population was students of the economic education study program who have passed TPACK-oriented courses, namely digital economic learning and ICT literacy and economic learning media, we called them preservice teacher (PST's). The sample in this group was 120 Economics PST's. Respondents were final year undergraduate students of economics education who had completed all lectures. Students had also graduated in digital learning courses and learning practices using digital devices. The respondents involved were on average 23 years old with 62% female and 38% male.

Data Analysis

The data that has been obtained was then analyzed using descriptive statistics and inferential. The data analysis technique used t test. The validity test carried out was the Pearson test and the reliability test with Cronbach's alpha. The validity test was carried out using the Pearson test which states that if r count > r table, then the item was said to be valid. Validity and reliability tests are conducted using the SPSS 25 program. Validity tests are needed to measure the extent to which the test instrument or questions used can measure the level of competence of each TPACK domain. With validity tests, you can ensure that the test results or answers to questions truly reflect the competence to be measured. Reliability measures the extent to which test instruments or questions can produce consistent results when used under the same conditions.

Research Procedure

The research procedure is broadly carried out in three stages, namely 1) need assessment 2) Developing model 3) validating model. The need assessment stage is carried out by assessing respondents' abilities in solving

questions about the TPACK concept, assessing the learning outcomes of courses related to digital learning, and assessing the availability of infrastructure. The design development process stage employs the ADDIE model, which comprises the following five stages: analysis, design, development, implementation, and evaluation (Spatioti et al., 2022; Shakeel et al., 2023). The analysis stage is carried out with The ADDIE steps are illustrated in Figure 1. There are 5 stages and ADDIE, namely 1) Analysis, at this stage Analyzing the results of the preliminary study, including weaknesses and strengths in TPACK competence and entry behavior analysis 2) Designing a competency development model. In this case, the researcher conducted a literature study of what strategies are needed to improve Teachers' TPACK abilities. At this stage, the method used is TPACK IDD IRR 3) the development stage is carried out by developing the IDD IRR design model (introduction, demonstration, development, implementation, reflection and revise. 4) the Implementation stage is carried out by Conducting training in TPACK materials. 5) the evaluation stage, assessing the model development process and contributions to the capabilities of each TPACK domain. After developing the model using the ADDIE method, the next research stage is to validate the model and measure the level of effectiveness of the model in improving competency in each TPACK domain. Procedure of research presented on figure 1.

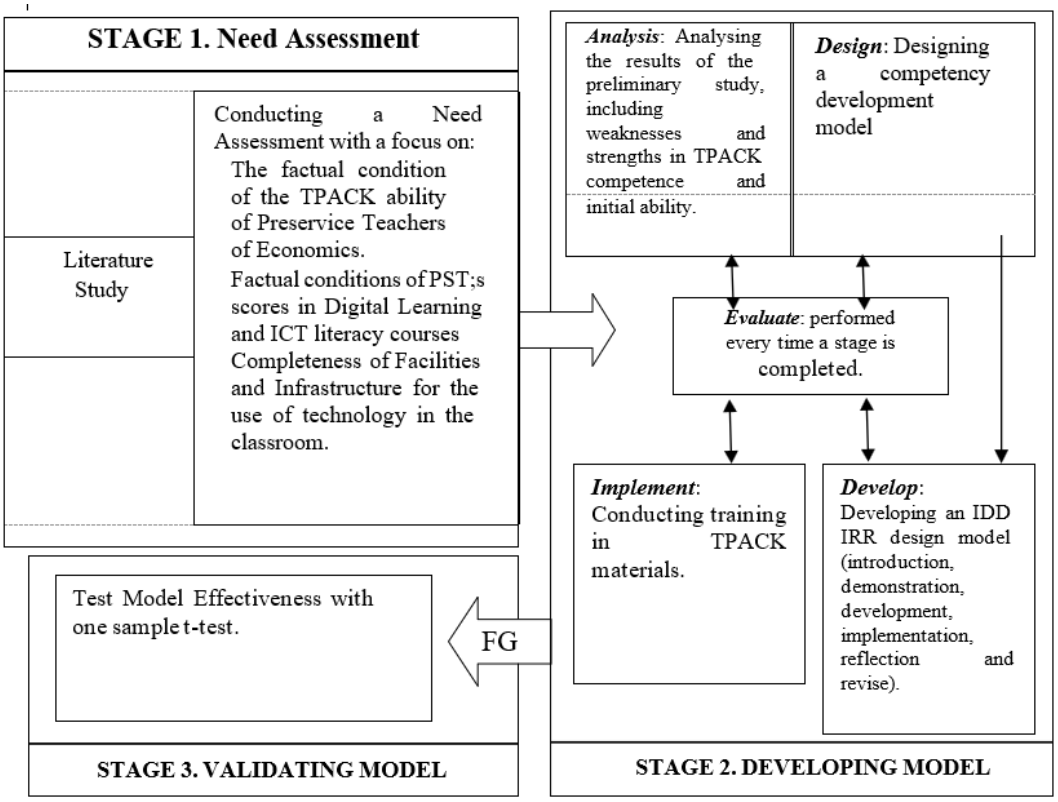

Figure 1. Research Procedure

The research was conducted in three stages: the first stage entailed a needs assessment, the second stage involved the development of the model, and the third stage was dedicated to model validation. In the initial phase of the study, a needs assessment was conducted through the administration of a

survey to 120 PST's respondents. These individuals had previously completed learning courses at the Economic Education Study Programme. The results obtained comprise information on TPACK competencies in each domain. The second stage is the model development stage, which employs the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) approach. The model that facilitates the development of TPACK competence is the IDD IRR model (introduction, demonstration, development, implementation, reflection, and revision). This model is validated using a one-sample t-test. If the t-value is greater than that of the t-table and the significance level is less than 0.05, it can be concluded that there is a difference in TPACK domain scores before and after the application of the IDD IRR development strategy.

RESULTS AND DISCUSSION

The results of this study include the results on each ADDIE step (Analysis, Design, Development, implementation, and Evaluation) and describe each stage of the research, including the implementation of the IDD IRR strategy. Beside that the instrument was used was valid and reliable while the r table at df 43 and $\alpha = 0.05$ was 0.2159 and all items have a calculated $r > 0.2159$. Thus, all items were valid. Reliability was tested with Cronbach's alpha. Items are reliable if Cronbach's alpha > 0.05. From the calculation results, Cron Bach's alpha is 0.847. So all the items used were valid and reliable. The matters discussed in this section are related to the research questions, namely 1) the results of the needs analysis and analysis of the strengths and weaknesses of PSTs in mastering the TPACK domain 2) Implementation of model development using the ADDIE method 3) The effectiveness of the TPACK IDD IRR strategy in developing PSTs' TPACK competencies.

Analysis

In the needs analysis section, in the ADDIE development research model, the first stage is to analyze the need for new product development (models, methods, media, teaching materials) and the feasibility and requirements of product development. The results of the TPACK development design needs analysis was presented in figure 2.

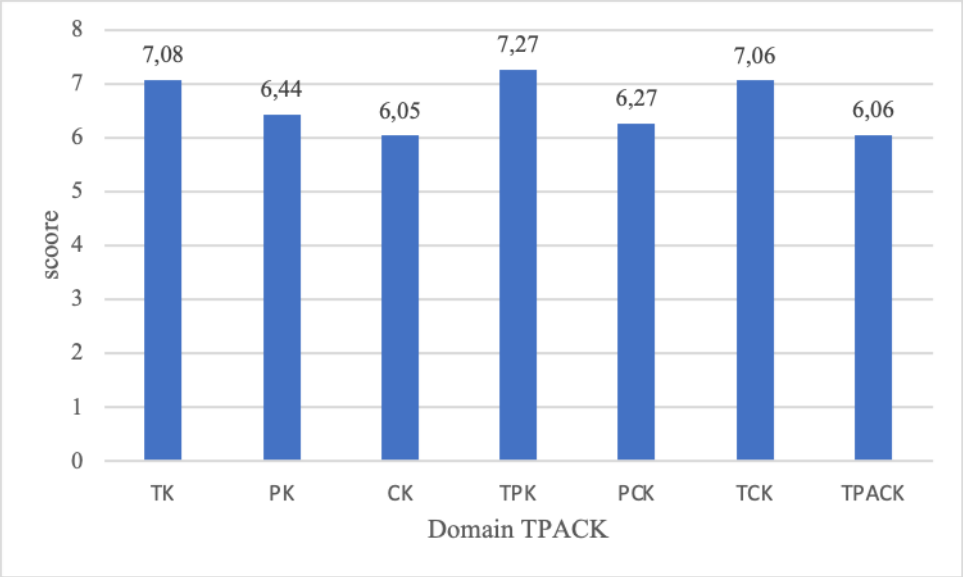

Figure 2. Analysis of the Weaknesses and Strengths of PST's TPACK Domain

The results of the survey on TPACK competence indicate that PST's primary challenges are in the areas of content knowledge and pedagogy content knowledge. This deficiency in content knowledge is evidenced by an absence of comprehension of macroeconomic material and a tendency to critique the implementation of macroeconomic policies.

Certain TPACK domain such as economics content knowledge, may show smaller improvement due to various factors. The smaller improvements in certain TPACK domanins, such as content knowledge, can be attributed to the complexity of distinguishing TPACK sub domain, variability in the effectiveness of educationalintervnetions and the stronger focus on the technological and pedagogical knowledge over content knowledge. These factors collectively contribute to the challenges in enhancing content knowledge within the TPACK framework. One way to improve content knowledge is by **customizing of Professional Development Programs**, **integration of technology and content knowledge** the integration of technology with content knowledge is crucial for creating effective learning environments and **Focus on Knowledge Transfer and Application** Training programs should emphasize the transfer and application of content knowledge to ensure that it is effectively passed from trainers to teachers and then to students. These strategies have been positively correlated with the development of preservice treachers TPACK indicating their effectiveness in preparing future educators (Baran et al., 2019; Tondeur et al., 2020). BOPPPS-TPACK (Bridge in, Objective, Pre Assesment, Partsipatory, Post Asessment, Summary) training model has been developed, which integates smart tools and pedagogy-driven approaches, This model has been effective in enhancing teacher's abilility to engage in depth learning and TPACK transfer, thus supporting their professional development (Zhang & Tang, 2021). In the context of economics education, TPACK has been applied to design practical curriculum such as the "Entreprise Operation and Decision Simulation System." This curriculum integrates teaching content, methodology and techniques under the TPACK

framework, significantly improving teaching quality and student satisfaction. It also enhances students profesional application and practice abilities, making it a valuable approach for curriculum development in economic management (Tao et al., 2017, 2017).

Conversely, the deficit in pedagogy content knowledge can be attributed to an inability to identify the optimal learning strategy for teaching economic material (Stylianides & Stylianides, 2006). PST's demonstrate a relatively higher level of competence in the domains of technology pedagogical knowledge (TPK), technological knowledge (TK), and technological content knowledge (TCK). In consideration of the advantages of TPACK competence as evidenced by the survey results, the technology domain is comparatively more advantageous than the other domains. This may be attributed to the characteristics of PSTs, a generation that is inclined to embrace technological, pedagogical, and content technology(Anjum, 2024; Cain et al., 2022; Kullolli & Trebicka, 2023).

Design

In the Design stage, instructional designers plan learning strategies, content, teaching methods, and evaluation. The purpose of designing is to create a detailed plan to achieve predetermined learning objectives (Al-Azawei et al., 2016; Tawfik et al., 2024). The assessment results obtained a development design with the IDD IRR (Introduction, Demonstrate, Develop, Implementation, Reflect, and Revise) technique (Lee & Kim, 2014). This model can be described on figure 3.

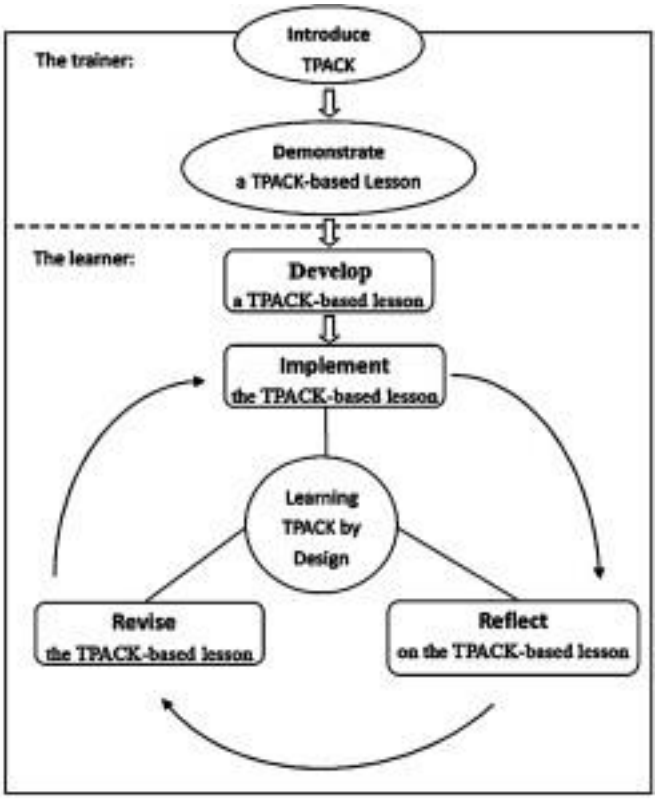

Figure 3. TPACK Competency Development Model IDD IRR

Source: Lee & Kim (2014)

The details implemented in the IDD IRR model are described in Table 1.

Table 1. Stages of Competency Development TPACK IDD IRR

Stages	Implementation	Implementer
Introduction	Trainers conducted lectures on TPACK knowledge interactive learning media production skills (running British economy).	Trainer
Demonstration	The trainer conducted a TPACK-oriented learning demonstration, which included preparing a digital lesson plan and implementing the lesson plan, using digital learning media, and conducting digital evaluation.	Trainer
Develop	Learners develop learning knowledge within the TPACK framework and are evaluated on their ability level (Develop-based-lesson).	The learner
Implementation	Learners practice microteaching within the TPACK framework, which consists of preparing lesson plans, implementing learning within the TPACK framework, and evaluating learning within the TPACK framework.	The learner
Reflect	Learners practice microteaching within the TPACK framework, which consists of preparing lesson plans, implementing learning within the TPACK framework, and evaluating learning within the TPACK framework.	The learner
Revise	Learners revise the implementation based on reflection information, revise the lesson plan, revise the learning implementation and revise the evaluation	The learner

Developing Stage

At this stage, learning tools that are aligned with the IDD IRR development model are created. At this stage, the lesson plan is prepared, along with the teaching materials, learning media, and learning technique methods. The lesson plan is based on the objectives to be achieved, which are detailed in the learning methods of discussion, demonstration, simulation, and project-based learning and coaching. In this section, technology is applied in learning which aims to increase student engagement (Bond & Bedenlier, 2019) and increase student creativity (Barai & Saha, 2022). TPACK materials are

prepared based on the type of material contained in the basic concepts of TPACK, the practice of preparing learning tools, and learning simulations (micro teaching).

Implementing Stage

The developed learning programme is applied in a real learning environment at this stage. At this stage, the TPACK competency development program is implemented with the IDD IRR strategy and the impact of the application of this method on skills in the seven components in question. The implementation and gains before and after the IDD IRR TPACK competency development activities were presented on Table 2.

Table 2. Implementation and Gain of IDD IRR TPACK Strategy

Stage	Implementation	Teaching Method	Gain Domain TPACK (Post test-Pre test)
Introduction	The trainers explained lesson plan development, digital learning media development, and HOTS evaluation tools in economic learning.	Lecture Question & Answer Discussion	Pedagogy Knowledge (PK) =3.25 Technology Knowledge (TK)=2.50 Content Knowledge (CK)=1.90 Pedagogy content knowledge (PCK) = 4.74 Technology Content Knowledge (TCK) = 2.75 Technology Pedagogy Content Knowledge = 3.43
Demonstration	Conducting a demonstration: Preparation of lesson plan Digital learning media production Preparation of HOTs evaluation tools Teaching simulation (microteaching).	Demonstration Method Simulation Method	Pedagogy Knowledge (PK) = 3.2 Technology Knowledge (TK)=4.23 Content Knowledge (CK) =2.15 Pedagogy content knowledge (PCK) = 2.76 Technology Content Knowledge (TCK) = 3.82

The TPACK IDD IRR competency development strategy is typically comprised of two key elements: IDD and IRR. The IDD stages (introduction, demonstration, development) constitute the preparatory and strategic design phases. At the introductory stage, the trainer provides a presentation on the fundamentals of TPACK, employing a combination of didactic, interrogative, and deliberative techniques. At this juncture, all TPACK domains demonstrate an increase. The domain demonstrating the greatest relative gain is pedagogy knowledge (PK), with a value of 3.25. This demonstrates that the implemented development strategy is effective in enhancing pedagogy knowledge (PK), particularly with regard to fundamental digital learning concepts that integrate

pedagogical, technological, and economic subject matter. Furthermore, content knowledge is relatively low in comparison to the other domains. This indicates that insufficient attention is devoted to the discussion of economic content at this stage (Dewi et al., 2021; Jaipal-Jamani et al., 2015; Latip et al., 2023).

At the demonstration stage, trainers demonstrate preparing lesson plans, producing digital learning media, preparing HOTs evaluation tools, and teaching simulations (microteaching). At this stage it is carried out using the demonstration method. At this stage, all TPACK domains increase. The domains that increased at this stage were Technology Knowledge (TK)=4.23 and Technology Pedagogy Content Knowledge=3.98. The material for preparing learning tools delivered using demonstration and simulation methods improves PST's technological and TPACK capabilities. Based on the results of the introduction and demonstration stages, the IDD IRR design was developed until it was ready to be implemented.

In the develop stage, PST's develops digital learning tools for economic learning which are continuously being improved. The development of this learning tool was delivered using the project based learning method. The results obtained from this stage, all TPACK domains increase. The highest gain obtained is Technology Pedagogy Content Knowledge, so based on this, developing TPACK with project based learning will develop overall TPACK competency (Waluyo, 2023; Fazilla & Bukit, 2024; Santos et al., 2023). This method also increases PST's economic content knowledge (Eckardt et al., 2020; Zhang & Ma, 2023). After passing the IDD stage, the TPACK-IRR stage is then carried out. The implementation of IRR was presented in Table 3:

Table 3. Implementation and Gain of the TPACK IRR Strategy (Implementation, Reflect, Revise)

Stage	Activities	Methods	Gain
Implement ation	Learners practice the learning implementation that has been prepared (microteaching).	Simulation (microteachi ng)	Pedagogy Knowledge (PK)= Technology Knowledge (TK)=3.21 Content Knowledge (CK)= 3.25 Pedagogy content knowledge (PCK)= 3.42 Technology Content Knowledge (TCK)= 4.21 Technology Pedagogy Technology pedagogy Content knowledge =3.51

Stage	Activities	Methods	Gain
Reflection	Reflection on the planning and implementation that has been practiced. Improvements related to the implementation of learning that has been done consist of the ability to open lessons and conduct initial diagnostics. Difficulties in implementing learning.	Coaching	Difficulties in lesson plan preparation consist of the following: a. Formulation of learning objectives b. Breakdown of objectives into indicators c. Determining the learning approach, whether CRT or TARL d. Selection of methods that follow the characteristics of the material and the characteristics of the students, consistency between objectives, learning methods, and evaluation to be carried out. Difficulties in the production of digital learning media: a. media suitability with the material b. determining media design that is not boring Difficulties in preparing digital evaluations: a. confusion between MOTs and HOTS instruments Difficulties in implementing basic teaching skills: a. difficulty in giving reinforcement b. ability to explain c. ability to guide
Revision	Revising the difficulties experienced	Coaching	Revision for difficulties in lesson preparation consists of: a. case-based remedial teaching on the Formulation of learning objectives b. case-based remedial teaching on the procedure for preparing indicators with the correct application of operational verbs c. Adjustment of material characteristics and student characteristics with TARL or CRT.

Stage	Activities	Methods	Gain
			d. Review the material chracteristics and objectivef with the method to be carried out. e. Re-examining the draft lesson plan and its consistency with other elements in the lesson plan.

The model implementation stages are carried out using learning simulations (micro teaching). The model implementation carried out using this simulation method improves the entire TPACK PST's domain. Of all domains, the gain of technology content knowledge (TCK) is relatively better than other TPACK domains. This shows that implementation of the simulation method (micro teaching) can increase mastery of content which is the main problem of PST's knowledge.

The next stage of TPACK-IDD IRR is reflection, which is carried out by coaching students on things that are easy to understand and material that is difficult. Students are also coached to come up with personal solutions to solve the learning problems they are experiencing. From the results of the reflection, it was found that there were difficulties in preparing lesson plans, difficulties in producing digital learning media, difficulties in preparing digital evaluations and difficulties in implementing basic teaching skills. The results of this reflection are then used as a basis for carrying out revisions. Revisions are carried out by coaching PST's by analyzing their abilities and discussions between participants and trainers.

Evaluating Stage

The final stage of the ADDIE development model is to analyze the effectiveness of the learning design in improving PST's TPACK competence. Evaluation can be formative (during development for continuous improvement) or summative (after implementation and overall assessment). The evaluation results decide whether the learning program meets the original objectives and whether improvements need to be made in policy implementation. The evaluation was conducted by t-testing the pre-test and post-test in each TPACK domain. The t-test recapitulation was presented on Table 4.

Table 4. of Differential Test of Pre and Post-Test Domain of Each TPACK Domain

Domain TPACK	Pre-test/Post-Test	T-Score	Significance	Meaning
Technology Knowledge	Pre-test	25.38	0.0	There is a difference in the ability to use Technology Knowledge before and after the IDD IRR development program.
	Post Test	58.24	0.0	

Domain TPACK	Pre-test/Post-Test	T-Score	Significance	Meaning
Pedagogical Knowledge	Pre-test	46.08	0.0	There is a difference in Pedagogical Knowledge ability before and after the IDD IRR development program.
	Post Test	66.60	0.0	
Content Knowledge	Pre-test	46.08	0.0	There is a difference in Content Knowledge ability before and after the IRR IDD development program.
	Post Test	66.64	0.0	
Technological Pedagogical Knowledge	Pre-test	31.48	0.00	There is a difference in Technological Pedagogical Knowledge ability before and after the IDD IRR development program.
	Post Test	133.94	0.00	
Technological Content Knowledge	Pre-test	22.62	0.00	There is a difference in Technological Content Knowledge ability before and after the IDD IRR development program.
	Post Test	91.58	0.00	
Pedagogical Content Knowledge	Pre-test	33.27	0.00	There is a difference in Pedagogical Content Knowledge ability before and after the IDD IRR development program.
	Post Test	103.93	0.00	
Technological, Pedagogical, and Content Knowledge	Pre-test	22.21	0.00	There is a difference in Technological, Pedagogical, and Content Knowledge ability before and after the IDD IRR development program.
	Post Test	94.95	0.00	

Based on the research results, the larger the t value, the larger the t table. This shows that there was a significant increase in TPACK competency before and after competency development.

CONCLUSION

This study is driven by the recognition that a significant number of economics teachers lack the requisite TPACK competencies, particularly in light of the accelerated advancements in information technology, the imperative for enhanced learning effectiveness, the evolving needs of students, and the distinctive characteristics inherent to economic content. It is thus evident that teacher competence in TPACK is of paramount importance. This urgency is the rationale behind the necessity of developing TPACK PSTs' economic competencies. The TPACK competency development model was

implemented using the ADDIE model (analysis, design, development, implementation and evaluation). The analysis revealed that PSTs exhibited deficiencies in economic and pedagogical knowledge competencies. The model development yielded the IDD IRR (introduction, demonstration, development) model, which was executed through discussion, simulation and project-based learning methods.

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