Physical Education teachers' pedagogical competence after completing professional development: an analysis of stakeholder feedback

Competencias pedagógicas de los profesores de Educación Física tras completar el desarrollo profesional: análisis de los comentarios de las partes interesadas

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Abstract

Introduction and method. This study employs a descriptive approach using a mixed-methods design, which combines qualitative and quantitative techniques to comprehensively analyze educational phenomena in a real-world context. In the qualitative phase, data were analyzed using NVivo 15 through coding and thematic categorization to identify patterns and generate key constructs. These were then operationalized into indicators that could be measured and tested quantitatively using SmartPLS 4 with a SEM-PLS approach, including the evaluation of measurement models and structural models.
Results. The results of the study indicate that all constructs met the criteria for convergent validity, with factor loadings above 0.70 and Average Variance Extracted (AVE) values exceeding 0.50. The R-squared values indicate strong explanatory power, particularly in explaining program effectiveness and program development.
Discussion. The discussion emphasized that the effectiveness of educational programs is greatly influenced by the synergy between teacher competence and institutional readiness.
Conclusion. In conclusion, the success of an educational program depends primarily on the quality of teachers and institutional support.

Keywords

Pedagogical competence, Physical Education, teachers, professional development, feedback.

Resumen

Introducción y método. Este estudio utiliza un enfoque descriptivo con un diseño de métodos mixtos, que combina técnicas cualitativas y cuantitativas para analizar de forma exhaustiva los fenómenos educativos en un contexto real. En la fase cualitativa, los datos se analizaron utilizando NVivo 15 mediante codificación y categorización temática para identificar patrones y generar constructos clave. Posteriormente, estos se tradujeron en indicadores que pudieron medirse y evaluarse cuantitativamente utilizando SmartPLS 4 con un enfoque SEM-PLS, incluyendo la evaluación de modelos de medición y modelos estructurales.
Resultados. Los resultados del estudio indican que todos los constructos cumplieron los criterios de validez convergente, con cargas factoriales superiores a 0,70 y valores de la varianza media extraída (AVE) superiores a 0,50. Los valores de R cuadrado indican un gran poder explicativo, especialmente a la hora de explicar la eficacia y el desarrollo de los programas.
Discusión. En el debate se hizo hincapié en que la eficacia de los programas educativos depende en gran medida de la sinergia entre la competencia del profesorado y la preparación de las instituciones.
Conclusión. En conclusión, el éxito de un programa educativo depende principalmente de la calidad del profesorado y del apoyo institucional.

Palabras clave

Competencia pedagógica, Educación Física, profesores, desarrollo professional, retroalimentación.

Introduction

For educators to effectively support student learning, they must have the knowledge and skills that accompany professional development.(Howell et al., 2025)This study will discuss various methods and strategies for professional development for teachers and their impact on student learning outcomes and teacher effectiveness. Professional development is important for all teachers to improve the quality of teaching.(Milton et al., 2025)Educational institutions can foster a culture of continuous improvement and ultimately raise the standards of teaching for all students by investing in teacher professional development.(Qi & Derakhshan, 2026)Teachers play a vital role in any educational environment. "Professionalism" refers to teachers who are experienced in their field and possess pedagogical, personal, social, and professional skills.(Al Hashimi et al., 2026)The quality of education can only improve if teachers are given the opportunity to develop their professional skills as students learn from them.(Yalçın et al., 2025),Adequate support and knowledge can have a positive impact on student achievement and the overall success of the school. To provide the best education for their students, physical education teachers must also prioritize their professional development and must strive to build positive relationships with fellow educators, as well as help each other.(Qamariah & Hercz, 2025),Physical education instructors can stay up to date on the latest research, teaching strategies, and curriculum innovations by participating in continuing education and training.(Crawford, 2025)Teachers can strengthen their knowledge base, improve their abilities or skills related to creativity, critical thinking, skills to form collaborations, communication skills, technology use skills, and information and media skills in learning, and improve their ability to inspire and engage students by taking advantage of professional development opportunities.(Garay Abad & Hattie, 2025)Continuing professional development can help educators meet the diverse needs of their students, adapt to evolving pedagogical practices, and build classroom environments that support each student's development. Teacher professional learning is increasingly sought after as a way to support the increasingly complex skills students need to learn in preparation for further education and 21st-century employment.(Berhanu, 2025),Sophisticated forms of teaching are needed to develop student competencies such as in-depth mastery of challenging content, critical thinking, complex problem solving, effective communication and collaboration, and independence.(Aibekkyzy et al., 2025)In contemporary school environments, leaders seeking to support professional development face many challenges. These challenges require educators capable of ongoing professional learning and adapting to change.(Nazim & Alzubi, 2025)Teachers can adapt their teaching strategies to better meet the diverse learning styles and needs of their students by staying up-to-date on the latest educational research and trends. The concept of teaching and learning styles emphasizes that each individual is unique. Each teacher teaches in their own way, and each student learns according to their own preferences.(Lopes et al., 2024),Educators can collaborate because they are in close proximity to colleagues or coworkers, exchange best practices, and generate new concepts to enhance student learning through professional development.(Channa & Sahito, 2022),In addition, continuing education can support educators to maintain their enthusiasm and motivation, which will ultimately improve student learning outcomes and make teaching a more rewarding experience.(Suyatno et al., 2023),One of the important elements in improving the professional development of educators is the importance of feedback from stakeholders or receiving strong support, and having access to new opportunities.(Ranta et al., 2023)Teachers can learn a great deal about what is working and what needs improvement in the school community by soliciting feedback from students, parents, administrators, and other members. By tailoring professional development opportunities to the needs and expectations of all stakeholders, this feedback can help improve teaching practices and student learning outcomes. Collaboration between intervention developers and school personnel is necessary to develop comprehensive supports that are appropriate to the school context, feasible to use, and deliver the desired results.(Succarie, 2024)Integrating stakeholder input into the planning and implementation of professional development allows educators to ensure that their efforts truly serve the needs of students and the broader school community. It all boils down to mutually supportive commodities that improve the quality of learning. The teacher community plays a central role in teacher professional development.(Milner & Scholkmann, 2023)For example, schools can ask students in focus groups or surveys about the effectiveness of various curricula or teaching strategies. Teachers can modify their methods based on this feedback to increase student engagement and improve learning outcomes.(Monteiro & Passarinho, 2026),Written feedback provided by teachers to their students is an important aspect of formative assessment.

Feedback plays a vital role in evaluating a process. Feedback is one of the strongest influences on learning and achievement, but its impact can be positive or negative.(Valeo et al., 2026),Its power is frequently mentioned in articles on learning and teaching, but surprisingly little recent research has systematically investigated its significance.(Park et al., 2025),Stakeholder input can help improve teaching strategies. Involving stakeholders in service evaluation and quality improvement can create a shared decision-making process that values diverse perspectives and interests. It's also important to remember that teachers possess knowledge and experience that shouldn't be overlooked.(Hordvik & Beni, 2024) ,Using stakeholder input alone may not always result in the best or most researched teaching techniques. Teachers must also rely on their own professional expertise and judgment when making decisions about their teaching strategies. Those involved in pre-service and in-service teacher training can build teachers' intrinsic decision-making processes, which have the potential to support greater decision effectiveness. The urgency of this research lies in the need to take action to analyze stakeholder feedback, in this case the principal, on the achievement of pedagogical competencies of teachers participating in the Teacher Professional Education program. This research aims to see how the achievement of pedagogical competencies is and how the feedback from its users or stakeholders. This research is important so that TPD participants or teachers can reflect on the results of the stakeholder feedback analysis. In addition, TPD organizers also need to know the responses to feedback from stakeholders, to be used as material for evaluation and improvement from each period.

Method

Participants

This research uses a descriptive method with a mixed methods approach (qualitative and quantitative).(Sieveke et al., 2026), to describe variables objectively based on actual conditions. Data were collected through interviews, observations, and questionnaires. In the qualitative stage, interview data were analyzed using NVivo 15 through a coding process and grouping themes. NVivo serves to identify key patterns, concepts, and constructs that form the basis for compiling research variables. (Sainchuk & Kaplinskyi, 2026),Next, the qualitative findings were converted into questionnaire indicators and analyzed quantitatively using SmartPLS 4. SmartPLS was used to test the validity and reliability of the constructs (outer model) and the relationships between variables (inner model) through SEM-PLS analysis. This approach ensures valid, reliable, and comprehensive research results, where NVivo plays a role in construct exploration, while SmartPLS plays a role in empirical model testing.

Population and Sample

The research subjects were stakeholders, in this case the principals of the teachers participating in the 3rd TPD program in 2023, physical education study program, totaling 120 people. The questionnaire question indicators relate to how the principals' responses or feedback related to the achievement of pedagogical competencies of their teachers, in this case, physical education teachers who are currently participating in TPD at Semarang State University. The sample in this study was all TPD participants in the 3rd physical education study program position in 2023 with a total of 120 physical education teachers.

Operational Definition of Variables

This study used a mixed methods approach, namely qualitative analysis with NVivo 15 and quantitative analysis with SmartPLS 4. Operational definitions of variables were compiled based on the results of theme exploration from interviews (NVivo) which were then converted into measurable indicators in the structural model (SmartPLS). Table 1 Operational Definition of Variables

Table 1. Operational Definition of Variables Nvivo and SmartPLS

No	Variables	Operational Definition	Indicators (NVivo - Themes)	Indicators (SmartPLS - Questionnaire Items)
1	Pedagogical Competence (KP)	Teachers' ability to plan, implement and evaluate PJOK learning effectively	Learning planning, classroom management, learning evaluation	KP1: Teachers organize systematic learning; KP2: Teachers manage the class well; KP3: Teachers evaluate learning
2	Learning Strategy (SP)	The method or method used by teachers in delivering learning materials	Variative methods, active learning, student-centered	SP1: Teachers use varied methods; SP2: Teachers implement active learning; SP3: Teachers are student-centered
3	Learning Media (MP)	Use of aids or media to support the learning process	Use of videos, props, digital media	MP1: Teachers use learning media; MP2: Media increases student interest; MP3: Media supports student understanding
4	Institutional Support (DI)	Forms of school support for teacher competency development	Support facilities, school policies, training	DI1: School provides facilities; DI2: School supports training; DI3: Schools provide supporting policies
5	Facility Constraints (KS)	Obstacles caused by limited learning facilities	Limited sports equipment, inadequate facilities	KS1: Limited facilities; KS2: Insufficient facilities; KS3: Inadequate learning tools
6	Technology Barriers (TC)	Barriers to the use of learning technology	Technological difficulties, low digital literacy	KT1: Teachers have difficulty using technology; KT2: Lack of digital mastery; KT3: Technology is not used optimally
7	Program Effectiveness (EP)	The success rate of the TPD program in improving teacher competency	Program impact, capacity building, usefulness	EP1: Program improves competence; EP2: Program is beneficial; EP3: Program is effective
8	Program Development (PP)	Efforts to improve and increase the quality of the TPD program	Practice needs, program evaluation, further development	PP1: Needs hands-on practice; PP2: Program needs to be developed; PP3: Program needs continuous evaluation

Cronbach's Alpha

Cronbach's Alpha is a measure used to test the reliability or internal consistency of a research instrument.(Vauhkonen et al., 2026),TheCronbach's Alpha value indicates the extent to which items or indicators in a variable correlate with each other and are able to measure the same construct. A variable is declared reliable if it has a Cronbach's Alpha value ≥ 0.70. The higher the Cronbach's Alpha value, the better the level of consistency of the research instrument.(Starreveld et al., 2026), the analysis using SmartPLS, Composite Reliability is usually used in conjunction with Cronbach's Alpha to ensure that the research instrument has a good level of reliability. If both values (Cronbach's Alpha and Composite Reliability) are ≥ 0.70, then the construct can be declared reliable and worthy of use in further analysis. The Cronbach's Alpha table can be seen in table 2 below.

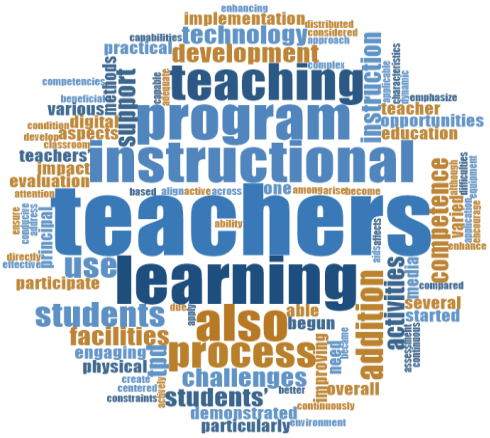
Table 2. Cronbach's Alpha

Alpha Value	Criteria
≥ 0.90	Very Reliable
0.70 – 0.89	Reliable
0.60 – 0.69	Quite Reliable
< 0.60	Not Reliable

Results

Word Cloud Nvivo

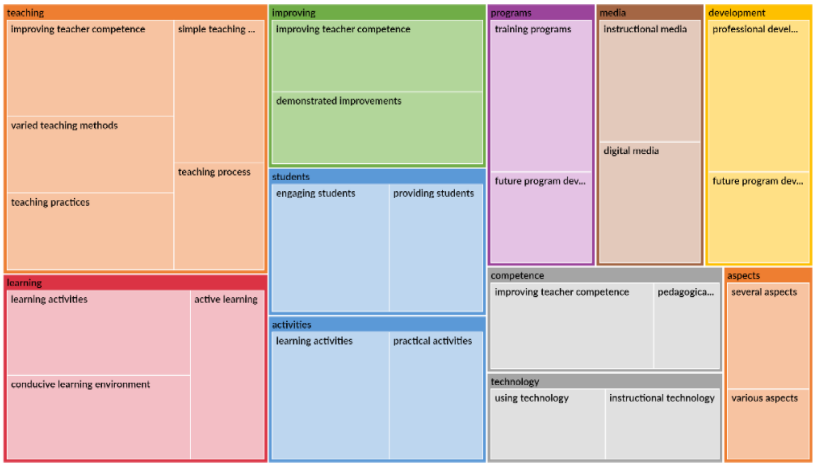
Figure 1. Nvivo Word Cloud analysis



The NVivo Word Cloud analysis results found in Figure 1 show that the words teachers, program, instructional, learning, and students emerged as the most dominant terms, confirming that teachers are the main actors in the implementation of learning programs and instructional processes. The dominance of the words learning and process indicates that learning is understood as a continuous process involving active interaction between teachers and students. Meanwhile, the emergence of words such as technology, facilities, and challenges indicates the existence of supporting factors as well as obstacles in program implementation. Overall, these findings confirm that the success of the program is greatly influenced by the role of teachers, institutional support, and the ability to manage challenges, especially in the technological aspect.

Hierarchy Chart

Figure 2. Nvivo Hierarchy Chart analysis results

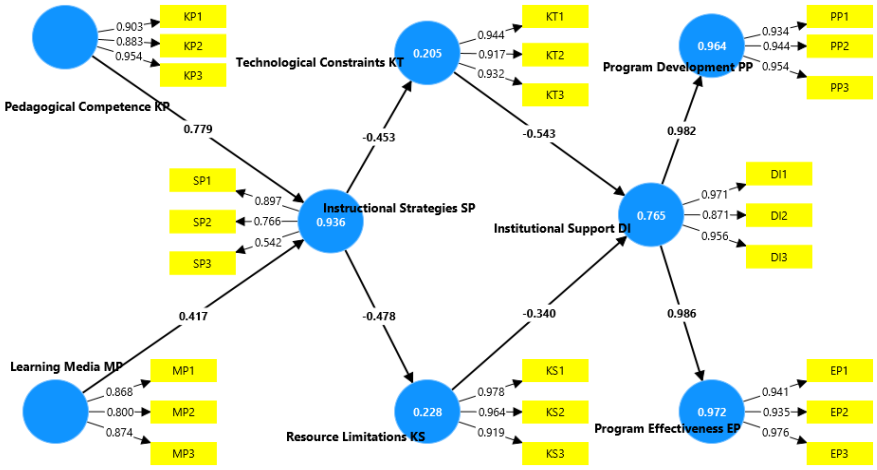


The NVivo Hierarchy Chart results in Figure 2 show that each color group represents an important, interrelated theme in the learning process. The orange color group (teaching) emphasizes the dominant role of teachers through competency improvement, method variation, and continuous teaching practices. The red group (learning) indicates that learning focuses on student activities and the creation of a

conducive learning environment. Green (improving) illustrates a significant increase in teacher competency as a result of the implemented program. Furthermore, blue (students and activities) indicates active student involvement through participatory and practical learning activities. Purple (programs) emphasizes the importance of training program support in improving learning quality, while light brown (media) indicates the role of learning media as a supporting factor. Yellow (development) reflects ongoing teacher professional development efforts. On the other hand, gray (competence and technology) indicates that competency and the use of technology are important aspects, although they can also be challenging. Finally, bright orange (aspects) illustrates various additional factors that influence learning. Overall, these findings indicate that learning success is the result of integration between teacher competence, student involvement, program support, and the use of media and technology.

Outer model Stage 1 SEM-PLS

Figure 3. Outer model results (Stage 1) SEM.PS



Outer model results (Stage 1) In Figure 3, it shows that most indicators have met the convergent validity criteria, as indicated by loading factor values > 0.70. Indicators in the Pedagogical Competence (KP) variable have high loading values (0.883–0.954) so they are declared very valid. The Learning Media (MP) variable also shows good loading values (0.800–0.874). In the Technological Constraints (KT) and Resource Limitations (KS) variables, all indicators have loadings above 0.90, indicating very high construct strength. However, in the Instructional Strategies (SP) variable, there is one indicator with a relatively low loading value, namely SP3 = 0.542, which is below the ideal limit of 0.70, so it needs to be considered for elimination in the next stage to optimize the model. Meanwhile, the indicators for the Institutional Support (DI), Program Effectiveness (EP), and Program Development (PP) variables show very high loading values (above 0.87), indicating that these constructs are highly reliable and capable of representing the latent variables well. To see the results of the outer model presentation (Stage 1), see Table 3 below.

Table 3. Outer model results (Stage 1)

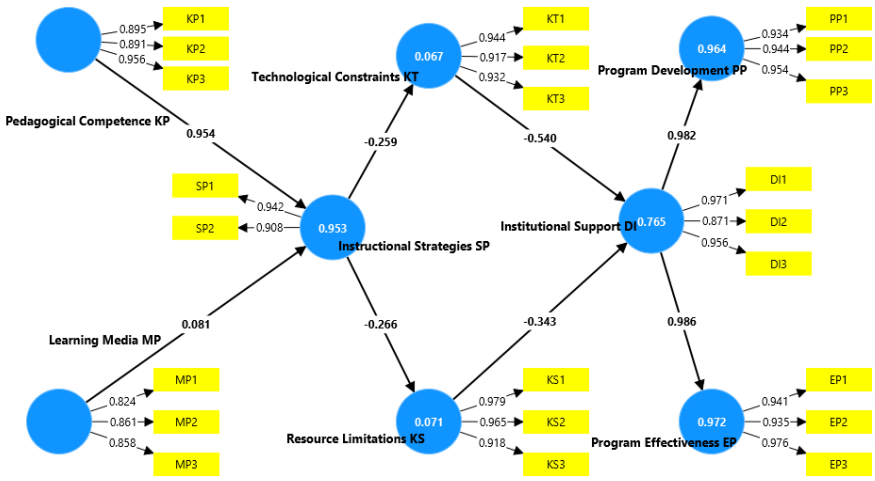
Variables	Institutional Support (DI)	Instructional Strategies (SP)	Learning Media (MP)	Pedagogical Competence (KP)	Program Development (PP)	Program Effectiveness (EP)	Resource Limitations (KS)	Technological Constraints (KT)	Information
DI1	0.971								Valid
DI2	0.871								Valid
DI3	0.956								Valid
EP1						0.941			Valid
EP2						0.935			Valid
EP3						0.976			Valid
KP1				0.903					Valid
KP2				0.883					Valid
KP3				0.954					Valid
KS1							0.978		Valid
KS2							0.964		Valid
KS3							0.919		Valid

KT1					0.944	Valid
KT2					0.917	Valid
KT3					0.932	Valid
MP1		0.868				Valid
MP2		0.800				Valid
MP3		0.874				Valid
PP1			0.934			Valid
PP2			0.944			Valid
PP3			0.954			Valid
SP1	0.897					Valid
SP2	0.766					Valid
SP3	0.542					Invalid

The results of the outer model testing stage 1 in table.3 show that most indicators in each construct have met the criteria for convergent validity, namely having a loading factor value above 0.70. In the Institutional Support (DI) variable, all indicators (DI1–DI3) have very high loading values (0.871–0.971) so they are declared valid. Similarly, in the Program Effectiveness (EP) and Program Development (PP) variables, all indicators show loading values above 0.93 which indicates a very good level of validity. The Pedagogical Competence (KP) and Learning Media (MP) variables also show good results with loading values above 0.80. In addition, the Resource Limitations (KS) and Technological Constraints (KT) variables have very high loading values (above 0.90), which indicates that the indicators are able to represent the latent construct strongly and consistently. However, in the Instructional Strategies (SP) variable, there is one indicator that does not meet the validity criteria, namely SP3 with a loading value of 0.542, which is below the minimum limit of 0.70. This indicates that the indicator is less able to optimally represent the Instructional Strategies construct. Meanwhile, indicators SP1 and SP2 are still declared valid even though SP2 is at the lower limit (0.766). Therefore, in the next stage it is recommended to eliminate the SP3 indicator to improve the quality of the measurement model. Overall, the outer model of the first stage has shown good results and is worthy of being continued to the next evaluation stage with minor improvements to the invalid indicators to proceed to stage 2.

Outer model Stage 2 SEM-PLS

Figure. 4 Outer model Stage 2 SEM-PLS



The outer model of Stage 2 in SEM-PLS in Figure 4 above shows the results of the evaluation of indicator quality (outer loadings) and construct validity after the internal model has been formed. In the figure, it can be seen that each indicator has a loading value that is generally in the adequate category (around ≥ 0.70) so that the indicator is considered to adequately represent the construct. For example, in the Technological Constraints KT construct, indicators KT1, KT2, and KT3 show relatively high loadings (around 0.895; 0.891; and 0.956, respectively), which confirms that this construct is valid as an indicator. Similarly, the Pedagogical Competence KP construct has indicators KP1–KP3 with loadings of around 0.895; 0.891; and 0.956, respectively, which means that pedagogical competence is measured strongly by its

items. In other constructs, the Institutional Support indicators (e.g., DI1–DI3) also showed high loadings (around 0.934; 0.971; and 0.934) thus supporting construct validity, while the Program Development PP indicators (PP1–PP3) also showed high loadings (around 0.944 0.917; and 0.934). For the Instructional Strategies SP and Learning Media MP constructs, indicators such as SP1–SP2 (around 0.942 and 0.908) and MP1–MP3 (around 0.824; 0.861; and 0.858) indicate that the construct–indicator relationship is quite strong. Finally, the Resource Limitations KS constructs (e.g., KS1–KS3 with loadings of approximately 0.979; 0.965; and 0.918) and Program Effectiveness EP (e.g., EP1 EP3 with loadings of approximately 0.986; 0.935; and 0.976) further reinforce that most indicators meet the criteria for good loading. Overall, the outer model of Stage 2 in the figure indicates adequate convergent validity because the majority of indicators have high loadings on their constructs, so the indicators are suitable for use in the next stage of testing the structural model (inner model). To see the results of the presentation of the Outer model of Stage 2, see Table 4 as follows.

Table 4. Results of the Outer model analysis Stage 2.

Variables	Institutional Support DI	Instructional Strategies SP	Learning Media MP	Pedagogical Competence KP	PP Development Program	EP Effectiveness Program	Resource Limitations KS	Technological Constraints KT	Information
DI1	0.971								Valid
DI2	0.871								Valid
DI3	0.956								Valid
EP1						0.941			Valid
EP2						0.935			Valid
EP3						0.976			Valid
KP1				0.895					Valid
KP2				0.891					Valid
KP3				0.956					Valid
KS1							0.979		Valid
KS2							0.965		Valid
KS3							0.918		Valid
KT1								0.944	Valid
KT2								0.917	Valid
KT3								0.932	Valid
MP1			0.824						Valid
MP2			0.861						Valid
MP3			0.858						Valid
PP1					0.934				Valid
PP2					0.944				Valid
PP3					0.954				Valid
SP1		0.942							Valid
SP2		0.908							Valid

The results of the outer model stage 2 in table.4 show that all indicators in each variable have met the convergent validity criteria, with loading factor values above 0.70 after eliminating invalid indicators in the previous stage. In the Institutional Support (DI) variable, indicators DI1–DI3 have high loading values (0.871–0.971) and are therefore declared very valid. The Program Effectiveness (EP) and Program Development (PP) variables also show very strong loading values (above 0.93), indicating that the construct is able to optimally represent the latent variable. Furthermore, the Pedagogical Competence (KP) variable has a very good loading value (0.891–0.956), while the Learning Media (MP) variable shows a fairly strong loading value (0.824–0.861). In the Resource Limitations (KS) and Technological Constraints (KT) variables, all indicators have very high loading values (above 0.90), indicating excellent consistency and strength of the construct. Furthermore, the Instructional Strategies (SP) variable after eliminating the SP3 indicator showed an increase in quality with loading values for SP1 and SP2 of 0.942 and 0.908, respectively, thus both were declared valid and strong in representing the construct. Overall, the results of the outer model stage 2 indicated that the measurement model had met all required validity criteria with no indicators requiring further elimination. Thus, the model was suitable to proceed to the next testing stage, namely the evaluation of the inner model. Therefore, this research was worthy of continuing to the Variance Extracted (AVE) test stage.

AVE test

Table. 5 Variance Extracted (AVE

Variables	(AVE)	Information
Institutional Support DI	0.872	Valid
Instructional Strategies SP	0.856	Valid
Learning Media MP	0.719	Valid
Pedagogical Competence KP	0.836	Valid
PP Development Program	0.891	Valid
EP Effectiveness Program	0.904	Valid
Resource Limitations KS	0.910	Valid
Technological Constraints KT	0.867	Valid

The results of the Average Variance Extracted (AVE) test in table.5 above show that all variables have met the convergent validity criteria, namely an AVE value above 0.50. The Institutional Support (DI) variable has an AVE value of 0.872, Instructional Strategies (SP) of 0.856, and Learning Media (MP) of 0.719, which indicates that each construct is able to explain more than 50% of the indicator variance. Furthermore, the Pedagogical Competence (KP) variable (0.836), Program Development (PP 0.891), and Program Effectiveness (EP 0.904) have very high AVE values, which indicate very good construct quality. Similarly, the Resource Limitations (KS 0.910) and Technological Constraints (KT 0.867) variables show a very strong ability to represent their indicators. Overall, these results confirm that all constructs in the model have met the requirements for convergent validity and are suitable for use in the next stage of analysis. Up to the Cross Loading Test testing stage

Cross Loading Test

Table 6. Cross Loading Test Results

Variables	Institutional Support DI	Instructional Strategies SP	Learning Media MP	Pedagogical Competence KP	PP Development Program	EP Effectiveness Program	Resource Limitations KS	Technological Constraints KT	Information
DI1	0.971	0.228	0.881	0.182	0.973	0.977	-0.908	-0.912	valid
DI2	0.871	0.291	0.857	0.166	0.835	0.838	-0.637	-0.647	valid
DI3	0.956	0.182	0.864	0.142	0.935	0.939	-0.845	-0.854	valid
EP1	0.930	0.223	0.905	0.156	0.945	0.941	-0.786	-0.786	valid
EP2	0.915	0.208	0.862	0.169	0.919	0.935	-0.862	-0.852	valid
EP3	0.967	0.175	0.887	0.118	0.972	0.976	-0.830	-0.840	valid
KP1	0.375	0.892	0.408	0.895	0.368	0.367	-0.463	-0.446	valid
KP2	0.015	0.879	0.126	0.891	0.006	-0.008	-0.018	-0.017	valid
KP3	0.088	0.896	0.112	0.956	0.076	0.063	-0.135	-0.139	valid
KS1	-0.886	-0.208	-0.791	-0.154	-0.876	-0.885	0.979	0.973	valid
KS2	-0.820	-0.185	-0.755	-0.150	-0.814	-0.832	0.965	0.944	valid
KS3	-0.755	-0.374	-0.726	-0.348	-0.772	-0.764	0.918	0.827	valid
KT1	-0.814	-0.220	-0.728	-0.176	-0.810	-0.810	0.890	0.944	valid
KT2	-0.781	-0.203	-0.686	-0.172	-0.766	-0.775	0.863	0.917	valid
KT3	-0.832	-0.297	-0.736	-0.263	-0.825	-0.839	0.927	0.932	valid
MP1	0.645	0.271	0.824	0.217	0.679	0.651	-0.620	-0.586	valid
MP2	0.817	0.301	0.861	0.222	0.815	0.825	-0.626	-0.598	valid
MP3	0.958	0.163	0.858	0.131	0.935	0.945	-0.846	-0.863	valid
PP1	0.915	0.231	0.918	0.182	0.934	0.941	-0.805	-0.786	valid
PP2	0.941	0.222	0.867	0.156	0.944	0.943	-0.852	-0.855	valid
PP3	0.924	0.184	0.863	0.129	0.954	0.933	-0.781	-0.794	valid
SP1	0.351	0.942	0.383	0.910	0.339	0.328	-0.409	-0.387	valid
SP2	0.076	0.908	0.160	0.892	0.046	0.032	-0.045	-0.056	valid

The results of the cross-loading test in Table 6 above show that all indicators in each variable have met the criteria for discriminant validity, namely the highest loading value is on the measured construct compared to other constructs. In the Institutional Support (DI) variable, indicators DI1, DI2, and DI3 have very high loading values on their respective constructs, namely 0.971; 0.871; and 0.956. These values are much greater than the loadings on other constructs, although it appears that the DI indicator also has a high correlation with Program Development (PP) and Program Effectiveness (EP and DI1 are 0.973 and 0.977). This is still acceptable because theoretically the three variables are closely related. In the Program Effectiveness (EP) variable, indicators EP1–EP3 also show a consistent pattern with the highest loading values on their own constructs, namely 0.941; 0.935; and 0.976. This value is higher compared to other constructs, although there is a high correlation with Program Development (PP) and

Institutional Support (DI), indicating a strong conceptual relationship between the variables. Meanwhile, in the Pedagogical Competence (KP) variable, indicators KP1–KP3 have loading values of 0.895; 0.891; and 0.956 respectively on their constructs, which are much higher compared to the values on other constructs, thus indicating that the indicators are able to represent the variables well. Meanwhile, the Resource Limitations (KS) and Technological Constraints (KT) variables show interesting characteristics, where the indicators have very high loading values on their own constructs (e.g., KS1 = 0.979; KS2 = 0.965; KS3 = 0.918 and KT1 = 0.944; KT2 0.917; KT3 = 0.932), but have negative values on other constructs. This pattern actually strengthens discriminant validity because it shows a difference in the direction of the relationship between the barrier variable and other variables. This indicates that the higher the resource limitations and technological constraints, the lower the relationship with positive variables such as institutional support or program effectiveness. In the Learning Media (MP) variable, indicators MP1–MP3 have loading values of 0.824; 0.861; and 0.858 on their constructs, which are higher than other constructs, although there is a fairly strong relationship with Institutional Support (DI) and Program Development (PP). Meanwhile, the Program Development (PP) variable also shows consistency with high loading values on its own construct (0.934; 0.944; 0.954), which indicates that the indicators are able to explain the variable well. Finally, in the Instructional Strategies (SP) variable, indicators SP1 and SP2 have the highest loading values on their respective constructs, namely 0.942 and 0.908, although they also have a fairly strong correlation with Pedagogical Competence (KP 0.910 and 0.892).This indicates that learning strategies are strongly influenced by teachers' pedagogical competence, yet they can still be distinguished as distinct constructs. Overall, the results of the cross-loading test confirm that all indicators have good discrimination between constructs, as each indicator represents its own variable more strongly than the other variables. Thus, the model has met the criteria for discriminant validity and is suitable for use in further analysis at the structural model testing stage. For further clarification, this research will continue to the structural model testing stage.R-square

TestR-square

Table 7. ResultsTestR-square

Variables	R-square	Adjusted R-square	Information
Institutional Support DI	0.765	0.757	Valid
Instructional Strategies SP	0.953	0.951	Valid
PP Development Program	0.964	0.964	Valid
EP Effectiveness Program	0.972	0.972	Valid
Resource Limitations KS	0.071	0.055	Valid
Technological Constraints KT	0.067	0.051	Valid

The cross-loading test results in Table 7 above indicate that all indicators have met the discriminant validity criteria. This is evident from the higher loading values of each indicator on its own construct compared to other constructs. For example, indicators DI1, DI2, and DI3 have the highest loading values on the Institutional Support (DI) variable compared to other variables, despite having a high correlation with several constructs such as Program Development (PP) and Program Effectiveness (EP). Similarly, indicators on the Program Effectiveness (EP) and Program Development (PP) variables show the highest loading values on their respective constructs, indicating good construct separation. For the Pedagogical Competence (KP) and Instructional Strategies (SP) variables, indicators also have the highest loadings on their own constructs, despite a fairly strong relationship between the two variables, which is theoretically acceptable. Meanwhile, indicators on the Resource Limitations (KS) and Technological Constraints (KT) variables show high positive loading values on their constructs and negative values on other constructs, which actually strengthens the differences between the variables. The Learning Media (MP) variable also showed a consistent pattern, with each indicator having the highest loading on the MP construct compared to other variables. Overall, these results indicate that each indicator is able to differentiate the constructs being measured well, thus the model meets the requirements for discriminant validity and is suitable for use in further analysis. This study now proceeds to the hypothesis testing stage to determine whether the results are valid or invalid.

Hypothesis Testing

Table 8. Hypothesis Test Results

Variables	(O)	(M)	(STDEV)	(|O/STDEV|)	P values	Information
Institutional Support DI -> Program Development PP	0.982	0.982	0.004	270,480	0.000	strong
Institutional Support DI -> Program Effectiveness EP	0.986	0.986	0.002	589,735	0.000	strong
Instructional Strategies SP -> Resource Limitations KS	-0.266	-0.261	0.154	1,728	0.084	Not strong
Instructional Strategies SP -> Technological Constraints KT	-0.259	-0.254	0.161	1,611	0.107	Not strong
Learning Media MP -> Instructional Strategies SP	0.081	0.083	0.036	2,242	0.025	Significant
Pedagogical Competence KP -> Instructional Strategies SP	0.954	0.950	0.016	59,776	0.000	(Very strong)
Resource Limitations KS -> Institutional Support DI	-0.343	-0.343	0.230	1,492	0.136	Not significant
Technological Constraints KT -> Institutional Support DI	-0.540	-0.538	0.231	2,335	0.020	Significant (Negative)

The results of the hypothesis test in Table 8 above show that not all relationships between variables in the model have a significant influence. The Institutional Support (DI) variable is proven to have a very strong and significant influence on Program Development (PP) and Program Effectiveness (EP), with a very high T-statistic value and a P-value <0.05, which confirms that institutional support is a key factor in the success and development of the program. In addition, Pedagogical Competence (KP) also shows a very strong influence on Instructional Strategies (SP), which means that teacher competence plays a major role in determining the quality of learning strategies. The Learning Media (MP) variable has a significant influence on Instructional Strategies (SP), although with a relatively smaller strength. Conversely, Instructional Strategies (SP) does not have a significant influence on Resource Limitations (KS) or Technological Constraints (KT), which indicates that learning strategies have not been able to overcome limited facilities and technological constraints. Furthermore, Resource Limitations (KS) also does not have a significant influence on Institutional Support (DI). However, Technological Constraints (KT) were shown to have a significant negative effect on Institutional Support (DI), meaning that the higher the technological constraints, the lower the level of institutional support. Overall, these findings confirm that institutional factors and teacher competency are the primary determinants, while constraints do not always have a direct impact on the effectiveness of the learning system.

Discussion

The results of the word cloud analysis using NVivo show that the terms "teachers," "instructional learning program," and "students" were the most dominant words appearing. This dominance indicates that the main focus of the research is on the role of teachers in implementing learning programs. Conceptually, the frequency of these words reflects the intensity of the discussion, where the words "teachers" and "instructional" indicate that teachers play a role not only as implementers but also as managers of the instructional process. In addition, the high occurrence of the words learning and process confirms that learning is seen as a continuous process involving active interaction between teachers and students. Meanwhile, the emergence of the words technology, facilities, and challenges indicates the existence of contextual dimensions that influence learning, both as supporting factors and as obstacles. Thus, qualitatively it can be concluded that the success of the learning program is largely determined by the dominant role of teachers, support facilities, and the ability to overcome challenges, especially those related to technology. Furthermore, the results of the Hierarchy Chart analysis can strengthen these findings by showing the grouping of themes based on the proportion of the contribution of each aspect. With the theme teaching (orange) appears to have the largest portion, which indicates that teaching activities and teacher competence are the main focus of attention in the data. Findings with the theme learning (red) also show a significant proportion, which indicates that learning is oriented towards students and the learning process is active. The theme improving (green) illustrates an increase in teacher competence as a result of the program, while the theme students and activities (blue) show student involvement in participatory learning activities. In addition, the themes programs (purple) and development (yellow) indicate that teacher training and professional development programs have a significant contribution to improving the quality of learning. The media theme (light brown) indicates that the use of

learning media is a supporting factor, while the competence and technology theme (gray) indicates that competence and technology are important aspects that can also be challenges. Overall, the distribution of these themes shows that learning is an integrated system between various interacting components based on the findings of the Nvivo analysis. Then, to strengthen the Nvivo analysis data, quantitative testing was carried out using SmartPLS. In the outer model stage (Stage 1) using SmartPLS, the analysis results showed that most indicators had met the convergent validity criteria with loading factor values above 0.70. In detail, the Pedagogical Competence (KP) variable had a loading value between 0.883 and 0.954, which indicated that the indicators in this variable were very strong in representing the construct. The Learning Media (MP) variable had a loading value between 0.800 and 0.874, which indicated a good valid category. In fact, the Resource Limitations (KS) and Technological Constraints (KT) variables show very high loading values, namely above 0.90 (for example KS1 = 0.978; KS2 = 0.964; KS3 = 0.919; and KT1 = 0.944; KT2 = 0.917; KT3 = 0.932),which indicates very strong indicator consistency. For the Institutional Support (DI) variable, loading values ranged from 0.871 to 0.971, while for Program Development (PP) and Program Effectiveness (EP), each was above 0.93, indicating a very high level of construct reliability. However, there is one indicator that does not meet the criteria, namely SP3 in the Instructional Strategies (SP) variable with a loading value of 0.542. This value is far below the minimum limit of 0.70, indicating that the indicator is unable to optimally represent the construct. Meanwhile, other indicators in the same variable, namely SP1 (0.897) and SP2 (0.766), are still considered valid even though SP2 is at the lower limit. Therefore, eliminating SP3 is the right step to improve the quality of the measurement model. Overall, this first stage shows that the model is quite good, but still requires some refinement. The results of the outer model of Stage 2, after eliminating the SP3 indicator, there was a significant increase in model quality. All indicators in each variable showed loading factor values above 0.70. For example, the Instructional Strategies (SP) variable experienced an increase with SP1 = 0.942 and SP2 = 0.908, indicating that this construct now has much better strength. Other variables also continue to show high consistency, such as Pedagogical Competence (KP) with a value of 0.891–0.956, Learning Media (MP) with a value of 0.824 0.861, and Institutional Support (DI)with a value of 0.871–0.971. The Resource Limitations (KS) variable even reached a very high value, namely 0.918 to 0.979, and Program Effectiveness (EP) reached up to 0.976. This indicates that all indicators have been able to represent the latent construct optimally, so that the measurement model is declared valid and reliable. The Average Variance Extracted (AVE) test results further strengthen the convergent validity of the model. All variables have an AVE value above 0.50, even most of them are in the very high category. The Institutional Support (DI) variable has an AVE of 0.872, Instructional Strategies (SP) of 0.856, and Learning Media (MP) of 0.719. Meanwhile, other variables such as Pedagogical Competence (KP 0.836), Program Development (PP 0.891), and Program Effectiveness (EP 0.904) showed excellent construct quality. The highest value was found in Resource Limitations (KS) at 0.910, meaning that more than 91% of the indicator's variance can be explained by this construct. Thus, all constructs have met the criteria for strong convergent validity. Furthermore, the results of the cross-loading test showed that each indicator had the highest loading value on its respective construct compared to other constructs. For example, indicator DI1 had a loading of 0.971 on the Institutional Support variable, much higher than the loadings on other variables. A similar thing also occurred in other indicators, such as KP3 which had a loading of 0.956 on Pedagogical Competence, and KS1 which reached 0.979 on Resource Limitations*. Interestingly,The indicators for the KS and KT variables show negative values for other constructs, which actually emphasizes the differences between the constructs. Overall, this indicates that the model has met the criteria for discriminant validity very well. The R-square test results also show that several variables have very high values, such as Program Effectiveness (EP) at 0.972 and Program Development (PP) at 0.964, indicating that more than 96% of the variation in both variables can be explained by the independent variables in the model. The Instructional Strategies (SP) variable also has a high R-square value of 0.953, while Institutional Support (DI) at 0.765 is still considered strong. However, the Resource Limitations (KS) and Technological Constraints (KT) variables have very low R-square values, at 0.071 and 0.067, respectively, indicating that these two variables cannot be explained by the model. Finally, the results of the hypothesis test indicate that the relationships between the variables are not all significant. The influence of Institutional Support (DI) on Program Development (PP 0.982; T = 270.480; $p < 0.001$) and on Program Effectiveness (EP) (0.986; T = 589.735; $p < 0.001$) was proven to be very strong and significant. In addition, Pedagogical Competence (KP) has a very strong influence on Instructional Strategies (SP) with a coefficient of 0.954 and a T-statistic of 59.776. The Learning Media (MP) variable also has a significant influence on Instructional Strategies (SP) although with a small coefficient (0.081; p =

0.025). On the other hand, Instructional Strategies (SP) does not have a significant influence on Resource Limitations (KS) or Technological Constraints (KT), which is indicated by a p-value above 0.05. In addition, Technological Constraints (TC) had a significant negative effect on Institutional Support (DI coefficient -0.540; p = 0.020), meaning that the higher the technological constraints, the lower the institutional support. Overall, the findings of this study confirm that the main factors determining the success of the program are institutional support and teacher competence, while constraints do not always have a direct influence on the learning system.The Resource Limitations (KS) and Technological Constraints (KT) variables have very low R-square values, at 0.071 and 0.067, respectively, indicating that the two variables are poorly explained by the model. Finally, the results of the hypothesis test show that the relationships between variables are not all significant. The influence of Institutional Support (DI) on Program Development (PP 0.982; T = 270.480; p < 0.001) and on Program Effectiveness (EP) (0.986; T = 589.735; p < 0.001) is proven to be very strong and significant. In addition, Pedagogical Competence (KP) has a very strong influence on Instructional Strategies (SP) with a coefficient of 0.954 and a T-statistic of 59.776. The Learning Media (MP) variable also has a significant influence on Instructional Strategies (SP) although with a small coefficient (0.081; p = 0.025). In contrast, Instructional Strategies (SP) did not significantly influence Resource Limitations (KS) or Technological Constraints (KT), as indicated by a p-value above 0.05. Furthermore, Technological Constraints (KT) had a significant negative influence on Institutional Support (DI coefficient -0.540; p = 0.020), meaning the higher the technological constraints, the lower the institutional support. Overall, the findings of this study confirm that the main factors determining the success of the program are institutional support and teacher competence, while the barrier factor does not always have a direct influence on the learning system.The Resource Limitations (KS) and Technological Constraints (KT) variables have very low R-square values, at 0.071 and 0.067, respectively, indicating that the two variables are poorly explained by the model. Finally, the results of the hypothesis test show that the relationships between variables are not all significant. The influence of Institutional Support (DI) on Program Development (PP 0.982; T = 270.480; p < 0.001) and on Program Effectiveness (EP) (0.986; T = 589.735; p < 0.001) is proven to be very strong and significant. In addition, Pedagogical Competence (KP) has a very strong influence on Instructional Strategies (SP) with a coefficient of 0.954 and a T-statistic of 59.776. The Learning Media (MP) variable also has a significant influence on Instructional Strategies (SP) although with a small coefficient (0.081; p = 0.025). In contrast, Instructional Strategies (SP) did not significantly influence Resource Limitations (KS) or Technological Constraints (KT), as indicated by a p-value above 0.05. Furthermore, Technological Constraints (KT) had a significant negative influence on Institutional Support (DI coefficient -0.540; p = 0.020), meaning the higher the technological constraints, the lower the institutional support. Overall, the findings of this study confirm that the main factors determining the success of the program are institutional support and teacher competence, while the barrier factor does not always have a direct influence on the learning system.while inhibiting factors do not always have a direct influence on the learning system.while inhibiting factors do not always have a direct influence on the learning system.

Conclusions

In conclusion, this study shows that the success of a learning program is largely determined by the dominant role of teachers, particularly through pedagogical competence and effective instructional strategies, and is strongly supported by institutional support. The NVivo and SmartPLS analyses demonstrate that the developed model is valid and reliable, with a significant relationship between institutional support, program development, and program effectiveness. While resource limitations and technological constraints do not have a direct impact, they remain contextual factors that need to be considered in improving learning quality.

Conflict of Interest Statement

The authors declare no conflict of interest related to this article.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request. The data is not publicly available due to the potential for respondent-identifying information and due to ethical considerations. However, all data used in the analysis have been validated and are available for academic purposes, research replication, or verification of results with the author's consent.

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