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RESEARCH ARTICLE

A Systematic Review of the Technology Integration Planning (TIP) Model in Educational Contexts

Nisa Ülkü ŞIK* Gazi University, TÜRKIYE
Mehmet Fatih TAŞAR Georgia State University, USA

Abstract

This systematic review examines the methodological applications of Roblyer's Technology Integration Planning (TIP) model and identifies existing gaps in the literature. Following the PRISMA 2020 framework, eight studies (2006–2024) were included. The PICOS framework was employed to systematically evaluate participant groups, intervention types, comparison structures, and reported outcomes. Findings reveal that the TIP model has been predominantly utilized with pre-service and in-service teachers to facilitate technology integration into instructional practice. The model positively impacted participants' Technological Pedagogical Content Knowledge (TPACK) competencies and supported the design of lessons aligned with learning objectives. It also reframes technology not as a functional instrument but as a deliberate pedagogical strategy. However, effective implementation requires structured and time-bound support mechanisms. A critical gap was noted in the model's limited application at primary and secondary levels, as its use remains largely confined to higher education and in-service teacher training contexts.

Keywords

Technology Integration Planning (TIP) model, pedagogical framework, systematic review, educational technology, instructional planning

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Introduction

The introduction of educational technologies into our lives has paved the way for the integration of technology into education. However, integrating technology into education does not only mean adding some technology to instruction. It also means integrating technology into all educational processes channeled through learning goals (Atun & Usta, 2019). Effective technology integration requires not only knowledge of content, technology, and pedagogy but also an understanding of the relationships between these elements (Koehler et al., 2007). In many models related to the integration of technology into the teaching process, the success of integration depends on teacher competencies (Orhan, 2015). Teachers and students participating in the technology integration process have different beliefs, goals, and objectives. This demonstrates that the use of technology in the classroom has a multidimensional structure (Taşar & Yılmaz Ergül, 2023). At this point, teachers' technological pedagogical content knowledge (TPACK) competencies are important in developing effective learning and teaching environments. A teacher who effectively integrates technology into education will be able to receive help from comprehensive content knowledge and pedagogical knowledge along with technological knowledge. Computer or instructional technology courses and teaching methods alone are not sufficient for teachers to develop their TPACK. These should be supported with technology-based elective courses specific to the field, and teachers need to continue their TPACK development by using ICT tools in their lessons (Aktaş & Özmen, 2020) The interaction of technology, pedagogy and content knowledge forms the basis of effective technology integration (Pierson, 2001).

In the 21st century, the over-encompassing rapid changes in technological fields has necessitated a transformation in educational approaches. In this context, the International Society for Technology in Education (ISTE) has developed digital age learning and teaching standards for students, teachers, educational leaders, and technology coaches to guide technology-enhanced teaching processes. The ISTE teacher standards encourage educators to develop as continuous learners and leaders by the requirements of the digital age and to integrate technology into the teaching process by integrating it with a pedagogical vision. In addition, these standards support the design of creative and technology-supported learning environments that consider student differences, model ethical digital behaviors, analyze learning data, and implement collaborative, data-driven teaching practices (Crompton, 2023). In this context, ISTE teacher standards provide guidance for the use of technology in the teaching process. They encourage teachers not only to use digital tools technically, but also to integrate them meaningfully into learning environments by integrating them with pedagogical goals. Thus, the teacher can use technology in their lessons as a student-centered, creative, and ethical learning experience. Technology integration is the process of planning, designing, implementing, and evaluating how to integrate the necessary technological tools into the learning/teaching process to solve a learning problem or meet different learning/teaching needs (Tanel, 2020).

Teachers face various difficulties while conducting the technology integration process. The planning challenges faced by teachers are categorized by Ertmer (1999) as first- and second-order barriers. First-order barriers refer to external factors such as access to resources, infrastructure,

*Corresponding author
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and administrative support, whereas second-order barriers relate to internal factors, including teachers' beliefs, knowledge base, and attitudes toward technology use. Overcoming these challenges requires strategic planning that considers both types of barriers to ease effective technology integration in classrooms.

The Technology Integration Planning (TIP) Model is a systematic guide designed to help teachers plan how to integrate technology into their lessons step by step (Roblyer & Doering, 2013). Rather than simply providing a list of tools, the model walks teachers through a structured process spanning from needs analysis to implementation and evaluation.

The most significant theoretical foundation of the model is the TPACK framework. Developed by Mishra and Koehler (2006), TPACK defines how a teacher should combine technological, pedagogical, and content knowledge effectively. The TIP Model then provides a roadmap for putting this knowledge into practice; notably, the model's very first phase requires teachers to explicitly assess their own TPACK level. In short, while TPACK explains what needs to be known, the TIP Model breaks down how that knowledge is to be applied.

When compared with other models in literature, TIP emerges as a more comprehensive framework. The SAMR model (Puentedura, 2006) and the RAT framework (Hughes et al., 2006) are retrospective evaluation tools that classify the degree to which a given technology transforms instruction; they do not offer guidance for the planning process itself. The TIP Model, by contrast, incorporates these tools within its own structure: during the "assessing relative advantage" step, teachers are prompted to consider which level of the SAMR or RAT scale their planned integration corresponds to. Although TIP shares structural similarities with classical instructional design models such as ADDIE and Dick and Carey (1978), it distinguishes itself by placing technology at the center of the design process rather than treating it as an add-on. Application-focused frameworks such as the 5W1H model address only one dimension of the process, whereas TIP addresses all relevant variables within a single, unified structure.

In this context, the Technology Integration Planning (TIP) Model developed by Roblyer and Doering (2013) offers a problem-solving approach for teachers to find the technology they need in their lessons and solve the problems they face. Each step suggested in their model refers to the stages of planning or implementing the use of technology to meet the needs of the teaching environment. The TIP Model consists of three stages and has seven steps (see **Figure 1**).

In the first stage, problems that negatively affect the learning process are identified, and how these problems can be solved with technology-based strategies is analyzed. In this context, first, a benefit analysis is conducted to question why the lesson should be supported with technology. The issues with which students have difficulty are evaluated in light of teacher experience, and the impact of technology-supported solutions to these problems is analyzed (Orhan, 2015). Teachers then evaluate their own ability to implement integration strategies. In this evaluation process, reviewing the competencies related to technological knowledge types contributes to

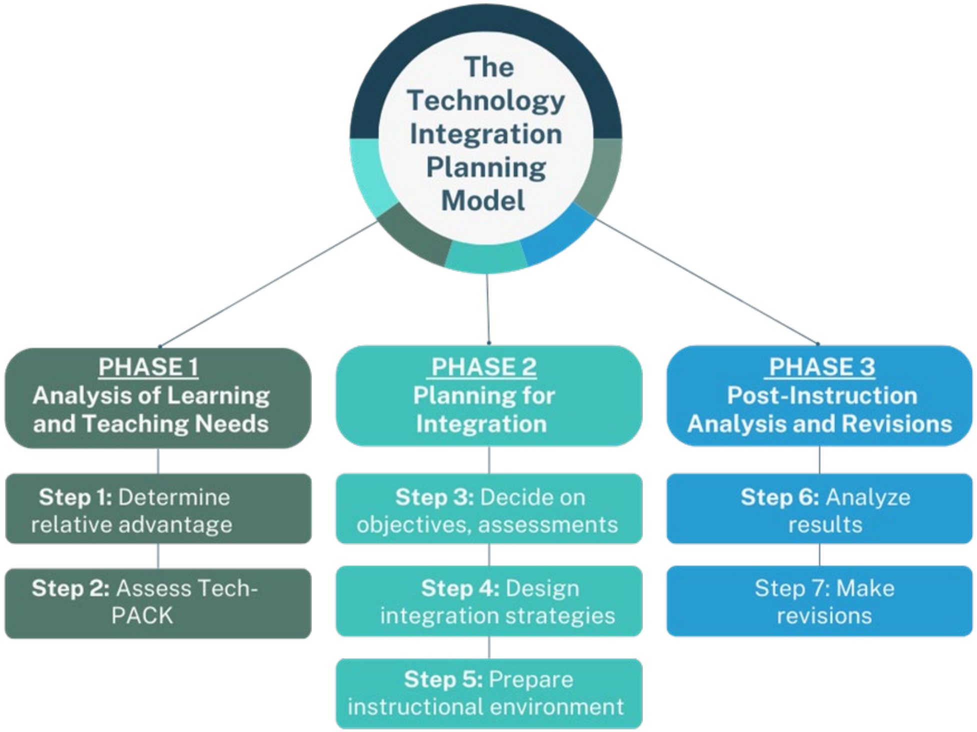

Figure 1. Technology Integration Planning Model (Roblyer and Doering, 2013)

teachers' ability to determine their individual learning goals and make more conscious integration decisions (Eren & Yurtseven Avci, 2016; Roblyer & Doering, 2013). In the second step, the teaching process is planned. In the third step, the goals and measurable learning outcomes to be achieved with technology-based methods are defined. These outcomes will be decisive in evaluating the effectiveness of the integration (Roblyer & Doering, 2013; Eren & Yurtseven-Avcı, 2016). In the fourth step, instructional strategies and the ways in which these strategies are implemented are determined. In this process, teachers develop an instructional plan in line with the nature of the subject, student needs, and available classroom resources and facilities (Roblyer & Doering, 2013). In the fifth step, the technological requirements of the teaching environment are evaluated. Appropriate hardware, software, and materials are identified, and preliminary preparations are made against potential technical problems (Eren & Yurtseven-Avcı, 2016). The third stage of the model covers post instructional analysis and improvement processes. Sixth and seventh steps fall under this category. The sixth step allows an assessment of whether the initially defined problem has been solved through technology-supported strategies. In this process, necessary arrangements are made by considering factors such as learning outcomes, applied strategies, student opinions, resource usage and timing (Eren & Yurtseven-Avcı, 2016). Finally, in the seventh step, the strategy is reviewed considering these evaluations, and suggestions for improvements are made for future applications (Roblyer & Doering, 2013).

TIP Model has potential for introducing pedagogically appropriate and effective use of technology and it is deemed to serve as a guide for teachers. However, there is no holistic evaluation of the current state of research using the TIP Model in literature. This situation is thought to make it difficult to provide a general framework for the current applications of the model and to find research gaps that will guide future studies. In this context, the aim of this study is to provide a holistic overview of the current applications of the model by systematically examining the studies conducted via the TIP Model and to reveal research gaps for future studies in this direction. Hence, it is feasible to ascertain a trajectory of theoretical advancement in the field and to discern gaps that could inform applied research. Accordingly, the PICOS framework was used as a basis for deciding the research questions to ensure clarity and focus, objectivity in the selection of studies, and consistency in the evaluation process. This framework consists of five components. These include population, intervention, comparison, outcome and study design (Higgins et. al., 2019).

Therefore, the research questions were as follows:

1. Who are the target group and participants to whom TIP Model is applied?
2. On which theoretical models or conceptual frameworks are TIP Model studies built?
3. Which platforms and tools supported TIP Model in the studies?
4. How were the learning outcomes of the studies using TIP Model and their performance in practice assessed, if any?
5. How do the research designs (quantitative, qualitative, mixed methods) of the studies using TIP Model vary?

Method

In this systematic review, studies conducted in the field of educational sciences using technology integration planning models were examined. In a systematic review, the studies to be examined are included within the scope of predetermined criteria, not randomly (Boz & Özcan, 2023). The four-step systematic review process based on 2022 What Works Clearinghouse (WWC) Handbook (p.25) served as a guide to standardize the research and minimize biases and inconsistencies in the findings. Thus, the processes of developing the review protocol, finding the literature, reviewing the studies, and reporting the findings are given in detail below (WWC, 2017). To develop the review protocol and identify literature at this stage, the protocol for finding the relevant articles was explained. Turkish and English sources were selected so that the researchers could understand the content. For this reason, the keywords and terms used to search the databases are given in **Table 1**.

Table 1. Boolean Search Strings by Database

Database	Boolean Search String
YÖKTEZ	("Technology Integration Planning Model" OR "TIP Model" OR "TIPM" OR "Teknoloji Entegrasyon Planlama Modeli" OR "TEPM") AND (education OR teaching OR learning OR eğitim OR öğretme OR öğrenme)
ProQuest Dissertations & Theses Global	(("Technology Integration Planning Model") OR ("TIP Model") OR (TIPM) OR ("Teknoloji Entegrasyon Planlama Modeli") OR (TEPM)) AND ((education) OR (teaching) OR (learning) OR (eğitim) OR (öğretme) OR (öğrenme))
Web of Science (WoS)	TS=(("Technology Integration Planning Model" OR "TIP Model" OR TIPM OR "Teknoloji Entegrasyon Planlama Modeli" OR TEPM) AND (education OR teaching OR learning OR eğitim OR öğretme OR öğrenme))
ERIC	("Technology Integration Planning Model" OR "TIP Model" OR "TIPM" OR "Teknoloji Entegrasyon Planlama Modeli" OR "TEPM") AND (education OR teaching OR learning OR instruction OR curriculum)
ScienceDirect	("Technology Integration Planning Model" OR "TIP Model" OR "TIPM" OR "Teknoloji Entegrasyon Planlama Modeli" OR "TEPM") AND (education OR teaching OR learning)
EBSCOhost	TX ("Technology Integration Planning Model" OR "TIP Model" OR TIPM OR "Teknoloji Entegrasyon Planlama Modeli" OR TEPM) AND TX (education OR teaching OR learning OR eğitim OR öğretme OR öğrenme)
SpringerLink	("Technology Integration Planning Model" OR "TIP Model" OR "TIPM" OR "Teknoloji Entegrasyon Planlama Modeli" OR "TEPM") AND (education OR teaching OR learning)
MDPI	("Technology Integration Planning Model" OR "TIP Model" OR "TIPM" OR "Teknoloji Entegrasyon Planlama Modeli" OR "TEPM") AND (education OR teaching OR learning) site:mdpi.com

The given keywords were structured with Boolean operators via the database used. Following the literature review through keywords, certain criteria were determined to ensure systematicity in identifying the articles. The inclusion and exclusion criteria for the studies included in this study were as follows:

1. Studies from 2006, when Roblyer and Doering published their technology integration planning model, to 2024 were included in the research. In 2025, studies from this year were not included in the scope of the research because of the ongoing data flow.
2. For the comprehensibility of the content by the researchers, Turkish and English studies were included as much as possible.
3. Among the technology integration models, only studies that used the "Technology Integration Planning Model" were included in the research, and other integration models were excluded.

4. These journal articles and review studies with methodologically detailed explanations were included, whereas short papers and abstracts without sufficient methodological explanations were excluded. Journal articles and theses were taken into consideration, as they were methodologically detailed and met academic standards. Studies in conference proceedings or book chapters were excluded because the evaluation process was limited.
5. In this study, to assess the literature on the subject comprehensively, widely used databases at both the national and international levels were used. For this reason, the databases used to find the relevant studies included YÖK national thesis center (YÖKTEZ), ProQuest Dissertations & Theses Global, Web of Science (WoS), ERIC, ScienceDirect, EBSCOhost, SpringerLink and MDPI. These databases provide access to national and international peer-reviewed publications and theses, making it possible to access current and high-quality studies in literature.

Screening and Evaluation of Studies

A total of sixty sources were identified through a systematic search conducted using the key terms listed in **Table 1** across the specified databases. The search process adhered to the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol, which has been widely adopted as the methodological standard for conducting and reporting systematic reviews across diverse academic disciplines, including educational research. The implementation of the PRISMA 2020 framework within the domain of systematic reviews in educational research ensures that such reviews are conducted with transparency, rigor, and methodological soundness. By providing a structured and replicable approach to the identification, screening, and synthesis of relevant literature, the PRISMA protocol minimizes the risk of selection bias and enhances the reproducibility of the review process. The preservation of the integrity of the research process is facilitated by a contribution to the synthesis of information that is academically and practically valuable in shaping educational practices and policies (Page et al., 2021). The systematic database search was conducted between January and March 2024.

In the preliminary review, fifty original studies were evaluated following the exclusion of ten duplicate records identified across multiple databases. The remaining studies were subsequently assessed in accordance with a set of predetermined inclusion and exclusion criteria developed prior to the commencement of the screening process. These criteria were designed to ensure that only studies directly relevant to the theoretical and empirical scope of the present review were retained for further analysis. Accordingly, forty-six studies were deemed eligible and included in the subsequent screening phase. However, following a thorough review of titles and abstracts, thirty-eight studies were excluded on the grounds that their theoretical frameworks were not directly related to the model under review, rendering them incongruent with the conceptual focus of the present study. The eight articles ultimately selected for full-text analysis were then examined in detail within the context of the guiding research questions.

The relatively limited number of studies meeting the inclusion criteria warrants critical reflection. The paucity of sources may indicate that empirical and theoretical engagement with the model in question has thus far been insufficient, suggesting that the field remains in an early stage of scholarly development. It is important to note that this scarcity of evidence does not reflect a limitation of the methodological approach adopted in the present review; rather, it is indicative of a broader gap in the existing body of knowledge. Consequently, the absence of a more substantial evidence base is interpreted as a lacuna in the extant literature, one that underscores the necessity for further primary research in this domain. The complete PRISMA flow diagram illustrating each stage of the selection process is provided in **Figure 2.**

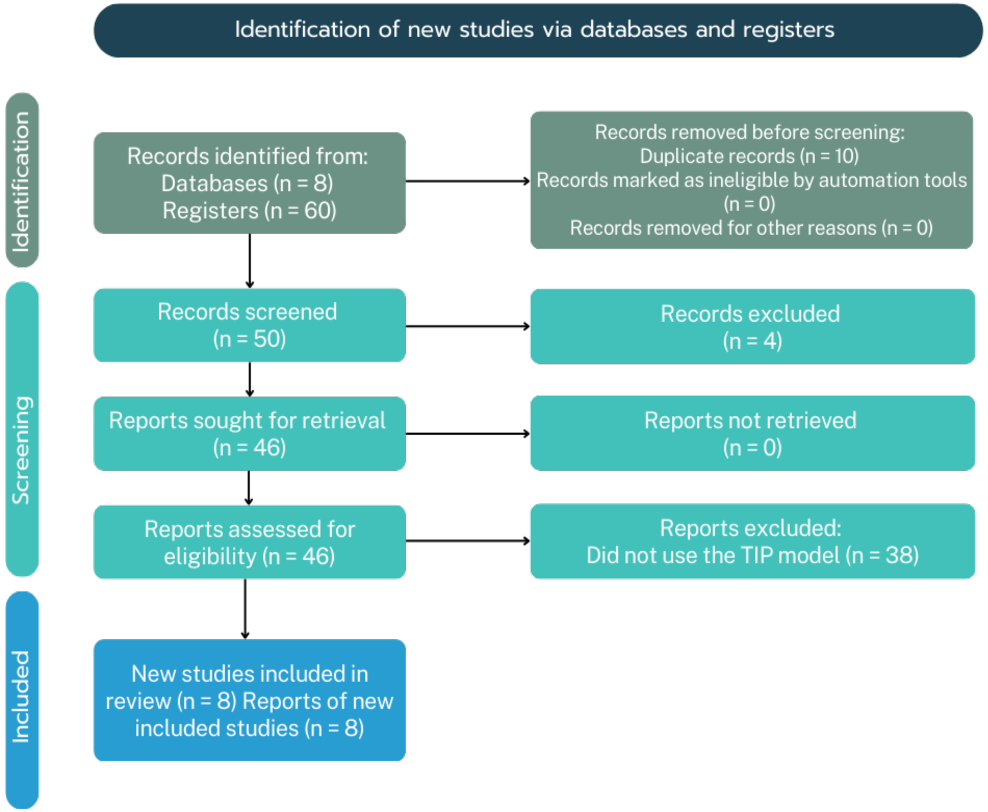

Figure 2. PRISMA flowchart for the selection process

Following the selection and exclusion procedures detailed in the PRISMA flow diagram, a total of 8 studies meeting the inclusion criteria were finalized for the systematic review. To evaluate the methodological rigor and the validity of the evidence provided by these studies, the Mixed Methods Appraisal Tool (MMAT, version 2018), developed by Hong et al. (2018), was employed. The MMAT was selected due to its unique capacity to concurrently assess various research designs within a unified and standardized framework. The appraisal process was conducted in two distinct stages.

Initial Screening: Each study was evaluated based on two preliminary questions regarding the clarity of the research objectives and the appropriateness of the data to address the research questions.

Design-Specific Evaluation: Studies that successfully passed the screening were categorized by their methodological designs (e.g., qualitative or mixed methods) and subsequently appraised against five core quality criteria specific to each category. The detailed analysis of the included studies, including their method types, specific MMAT scores, and identified methodological risk levels, is presented in **Table 2.**

Table 2. Comparative Assessment of Studies Based on MMAT Criteria

Study	Design	S1	S2	C1 Qual: 1.1 MM: 5.1	C2 Qual: 1.2 MM: 5.2	C3 Qual: 1.3 MM: 5.3	C4 Qual: 1.4 MM: 5.4	C5 Qual: 1.5 MM: 5.5	Overall
Mumcu & Kuskaya (2011)	Mixed	Yes	Yes	Yes	CT	CT	No	Yes	Moderate
Orhan (2015)	Mixed	Yes	Yes	Yes	Yes	Yes	CT	Yes	High
Eren & Avci (2016)	Qualitative	Yes	Yes	Yes	Yes	Yes	CT	CT	Moderate
Beisel (2017)	Qualitative	Yes	Yes	Yes	Yes	Yes	Yes	Yes	High
Joubert (2019)	Qualitative	Yes	Yes	Yes	Yes	Yes	Yes	Yes	High
Uluuysal & Kurt (2022)	Qualitative	Yes	Yes	Yes	Yes	Yes	Yes	Yes	High
Gunay Kilic (2023)	Mixed	Yes	Yes	Yes	Yes	Yes	CT	Yes	High
Hsu & Cheah (2023)	Qualitative	Yes	Yes	Yes	Yes	Yes	Yes	Yes	High

Yes = criterion met CT = Can't Tell (partially met/ambiguous) No = criterion not met C1–C5: Sequential criteria for each design type.

According to Moher et al. (2015), the foundation of a systematic review must be a predetermined protocol. This finding suggests that the review process has been meticulously and methodically designed, with the planned procedures having been thoroughly delineated in advance. The integration of the PICOS criteria into systematic reviews serves to mitigate potential biases that may emerge from ambiguous definitions or poorly defined variables. In this context, the participants, interventions, comparisons, outcomes, and study design (PICOS) criteria were taken into account in the review of the eight identified studies. The employment of these criteria proved instrumental in the systematic categorization and analysis of studies concerning interventions and their functionality in learning contexts. The following criteria are elucidated hereafter:

Population: This refers to the target group or participants in the studies analyzed.
Intervention: This refers to the methods or strategies examined in the research.
Comparison: This refers to the alternative method or control group used to compare the results of the experimental group.
Outcome: Variables measured and evaluated in the research.
Study Design: This refers to the methodological structure of the included studies (Higgins et. al., 2019)

The synthesis of findings across the included studies was conducted using a narrative synthesis approach, as outlined by Popay et al. (2006), which is particularly suited to systematic reviews in which the heterogeneity of study designs and contexts precludes the use of statistical meta-analysis. Narrative synthesis enables the integration of diverse evidence through a structured, text-based process that prioritizes conceptual coherence and interpretive rigor over numerical aggregation (Popay et al., 2006). In the present review, the findings were organized and presented according to thematic categories derived from the PICOS framework thereby providing a systematic structure for cross-study comparison and interpretation. This approach facilitated the identification of convergent and divergent patterns across the included studies while maintaining transparency in the analytical process. By grounding the synthesis in a predetermined organizational framework, the review sought to minimize interpretive bias and ensure that the conclusions drawn were traceable to the empirical evidence base.

Analysis and Findings

When the studies that used the technology integration planning model as a method between 2006 and 2024 were examined, 8 studies were found. Basic bibliographic information about the studies is given in **Table 3**. This information is structured to assess the diversity of the literature under review, the academic context in which it was published and its geographical distribution.

Table 3 shows that 5 out of these 8 studies originated from Türkiye (62.5%). The publication types of the 8 studies were equally divided between theses and articles. When the application areas are examined, studies are conducted mostly in the fields of Computer Education and Instructional Technology (CEIT).

Table 3. Bibliographic Characteristics of the Studies Examined

Authors/Year	Type of Publication	Country	Field of Application
Kuşkaya-Mumcu, (2011)	Doctoral Dissertation	Türkiye	Computer Education and Instructional Technologies (CEIT)
Orhan (2015)	Article	Türkiye	Computer Education and Instructional Technologies (CEIT)
Eren & Yurtseven Avci (2016)	Article	Türkiye	Computer Education and Instructional Technologies (CEIT)
Beisel (2017)	Doctoral Dissertation	USA	Teacher Education, Instructional Technology
Joubert & Callaghan (2019)	Master's Thesis	South Africa	Teacher Education, Instructional Technology
Uluuysal & Kurt (2022)	Article	Türkiye	English Language Teaching (ELT)
Günay Kılıç (2023)	Master's Thesis	Türkiye	Early Childhood Education
Hsu, Cheah, & Hughes (2023)	Article	Ireland & USA	Science Education

Findings Related to the First Problem: TIP Model Target Group and Participants

The participant profiles of the studies included in the research within the research question "Who are the target group and participants to whom TIP model is applied?" are given in **Figure 3** below. It reveals that the studies were mostly conducted with undergraduate students (n=188) and teachers (n=80) studying at a faculty of education; only one study was conducted with novice teachers. The number of participants varied between 1 and 62. In the review, no study focused on K-12 education level.

Findings Related to the Second Problem: Theoretical Models or Conceptual Frameworks for TIP Model Studies

The findings obtained from the studies included in the research are as follows: "What kind of technologies do the interventions applied in the studies include?" are given in **Table 4.**

When the studies included in the research presented in **Table 4** were analyzed, the ICT tools used varied in terms of diversity and functionality. The analysis revealed that the technologies used were shaped according to the teaching aims and the structure of the learning environments. The technologies most often used in the analyzed studies include interactive whiteboards, tablets, computers, mobile devices and Web 2.0 applications. These tools were preferred to ease access to digital content, support students' active participation in the lesson and make teaching processes more interactive. Social networking platforms, wiki environments and learning management systems (LMSs) were used effectively in collaborative learning, discussion and feedback processes. Web 2.0 tools have attracted students' attention and encouraged creativity. In addition, augmented and virtual reality technologies were among the technologies met in the studies.

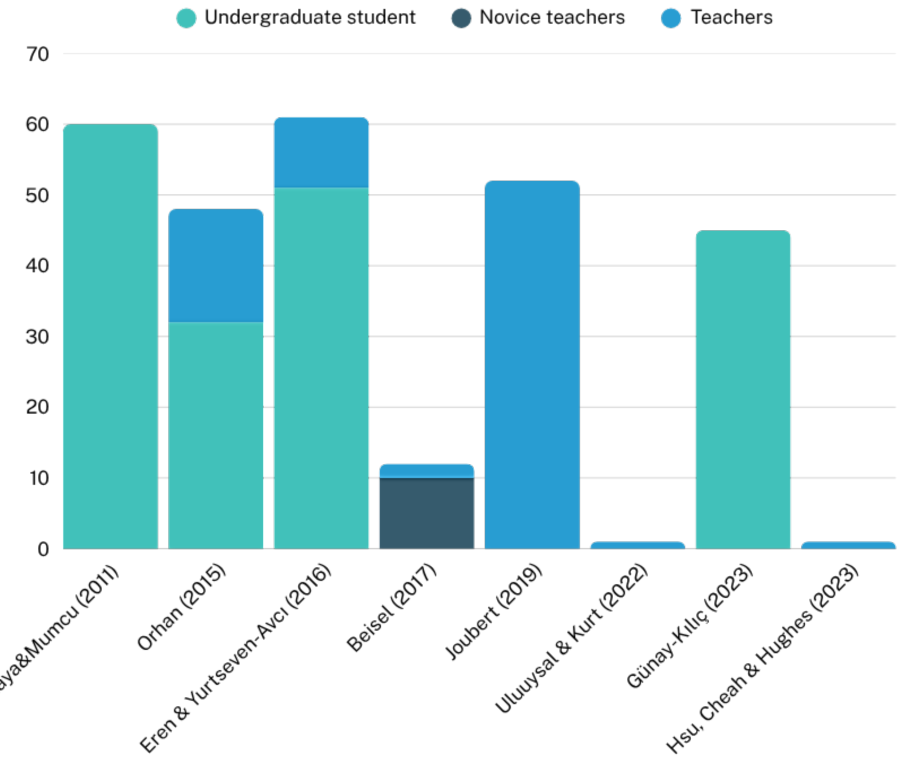

Figure 3. The background and number of participants in the eight studies in focus.

Table 4. Implemented Interventions

Authors/Year	ICT Tools	Explanation
Kuşkaya - Mumcu (2011)	ELGG Social Network Platform (https://elgg.org/)	They were used for activities such as discussion, content sharing, reflection and lesson plan preparation.
	Multimedia Resources	Videos, interactive content in lesson plans
Orhan (2015)	Interactive Board, Computer, and Tablets	Digital content was accessed by both teachers and students.
	e -materials	Digital content specifically designed for learning aims, to engage students and support the teaching process.
	Wiki environment (PBworks)	It was used for reflection reports and written discussions, as well as a digital platform to document the collaboration process.
	Internet and Online Search Engines	It is actively integrated into the lessons for students' project work and content research.
Eren & Yurtseven-Avcı (2016)	Interactive whiteboards and tablets	played a role in the implementation of e-content in the classroom, content access and use.
	Multimedia Design Software (Canva, Adobe Illustrator Camtasia, PowerPoint etc.)	used for e-content production
	EBA (Education Information Network)	platform for teachers and students to access digital content. Ready-made content evaluated in use.
Beisel (2017)	iPads, Chromebook and Laptops	content access, task completion and digital interaction in education.
	Social media and internet-Based Access	Students' access to online resources and their use of social media were considered as part of the technological dynamics in the educational environment
	Digital Education Materials	PDFs, presentations, digital curriculum maps and technology-enhanced teaching materials prepared by teachers were taken into consideration.

Table 4 (continued)

Authors/Year	ICT Tools	Explanation
Joubert & Callaghan (2019)	Computers, tablets and smartphones	In the preparation of teaching materials and online interactions
	LMS (Learning Management System)	Discussion boards, content sharing and feedback process were conducted through platforms such as Blackboard Learn.
	Augmented Reality & Virtual Reality	VR/AR experiences (select examples limited but VR/AR experiences (specific examples are limited but in general context)
	Photos, Videos, and Reports	Visual/digital content production and sharing
Uluuysal & Kurt (2022)	Web 2.0 Tools (QuizStar4Teachers, Toondoo, GoAnimate, Voki, Prezi, FamilyEcho, Google Docs)	To attract students' attention and increase interaction.
Günay-Kılıç (2023)	Kodu Game Lab	A visual and interactive game design tool that encourages algorithmic and creative thinking.
	Scratch	The block-based programming platform is used to teach children computational thinking and problem-solving skills.
Hsu, Cheah & Hughes (2023)	Aurasma (HP Reveal)	A user-friendly AR platform with no coding needed.
	Smartphones and Mobile Applications:	Enables students to scan real objects and access digital content.
	Digital Visual Triggers	Matching the visuals used in recognizing plant species with AR.

Findings Related to the Third Problem: Platforms and Tools supporting the TIP Model

The findings obtained to answer the research question "What are the groups or situations used for comparison in the study?" are given in **Table 5.**

Table 5. Situations/Groups Used for Comparison

Author(s)/Year	Comparing Group/Status
Kuşkaya-Mumcu (2011)	There is no control group. A time-based comparison was made on pretest, midterm and post-test.
Orhan (2015)	There is no direct control group in this study. However, students' prior feelings and post-internship beliefs are evaluated comparatively
Eren & Yurtseven-Avcı (2016)	In this study, there is no direct control group, but teachers' views compared to their teaching practices before e-content.
Beisel (2017)	There is no clear comparison group; however, teachers' integration levels were compared among themselves according to the SAMR model
Joubert & Callaghan (2019)	Although there is no direct comparison with traditional Lesson Study applications, the supportive role of technology in isolation situations without remote collaboration is discussed comparatively.
Uluuysal & Kurt (2022)	No comparison group: however, comparative development was examined according to the teacher's status before the process (there is a qualitative comparison as before-after)
Günay-Kılıç (2023)	Quantitative change analysis by comparing pretest and post-test. Comparison of self-efficacy and attitude levels before and after implementation.
Hsu, Cheah & Hughes (2023)	The traditional teaching method (e.g., physical materials used during the field trip) was compared with the AR-supported teaching approach. Students' interest levels, interactions and content learning performance were analyzed.

When the findings given in **Table 5** are analyzed, most of the studies did not include a control group in the classical sense; instead, time-based comparisons were made across pre- and post-intervention situations. In some studies, comparisons were made on the basis of the participants' own previous experiences or feelings or the internal development levels of individuals. Only one study directly compared the traditional teaching method with the augmented reality-supported teaching approach. These findings show that the comparisons in the studies were mostly constructed on the basis of time-based or alternative situations instead of the control group and were generally managed with qualitative or mixed methods.

Findings Related to the Fourth Problem: Learning Outcomes of TIP Model Studies

The findings for the research question "How were the learning outcomes of the studies conducted using TIP Model and their performance in practice evaluated?" The findings obtained for the research question are given in **Table 6.**

Table 6. Learning Outcomes

Author(s)/Year	The Findings from The Selected Studies
Kuşkaya-Mumcu (2011)	It was seen that there was a positive change in undergraduate students' skills and understanding levels of TPACK components and their attitudes toward technology. It was stated that the use of the TIP model in the process contributed to this situation.
Orhan (2015)	There was a positive change in students' feelings of the identity of instructional technology specialists and improvement in their knowledge and skills on technology integration. Students were made aware of career opportunities outside of teaching. Working within the framework of TIP Model enabled teachers to evaluate technology integration as a process that serves pedagogical goals and positively affected their feelings of technology use.
Eren & Yurtseven-Avcı (2016)	TIP Model provided support in terms of improving teachers' perceptions, competencies and skills in using technology in pedagogical contexts, but it was seen that it needed to be strengthened in terms of structure, time and supportive mechanisms for the sustainability of integration into the teaching process.
Beisel (2017)	Teachers' technology integration levels remained at the lower stages of the SAMR model (Substitution and Augmentation), and they needed more support for the model to reach more transformative levels. It was stated that the TIP model can contribute to teachers' effective technology integration.
Joubert & Callaghan (2019)	The TIP model was used in the planning and implementation of the Blended Lesson Study approach, and it was concluded that teachers performed technology integration in a problem-based and conscious way, and pedagogical integration with TPACK components was achieved
Uluuysal & Kurt (2022)	Teachers used the TIP model in their material development processes, and it was seen that teachers improved both in technological and academic areas. It was seen that the model enabled teachers to advance their planning, implementation and evaluation processes in a systematic way.
Günay-Kılıç (2023)	The TIP model was used to structure the coding training process and at the end of the study, it was seen that there was a significant increase in the participants' self-efficacy and attitude levels toward coding.
Hsu, Cheah & Hughes (2023)	The TIP Model was used as a theoretical framework to understand a biology teacher's process of integrating augmented reality (AR) technology into her course. At the end of the process, this process, which was intertwined with TPACK, revealed the teacher's ability to think about technology, content and pedagogy together.

The findings in **Table 6** show that the studies conducted with the TIP model have helped the participants' gain awareness of and develop positive attitudes toward use of technology. In addition, it was revealed that it improved their pedagogical perspectives and increased their professional competencies.

Findings Related to the Fifth Problem: Research Designs in TIP Model Studies

The findings obtained to answer the research question "How are the research designs of the studies conducted via TIP Model distributed?" are given in **Table 7.**

Table 7. Research Designs (Study Design)

Author(s)/Year	Study Design
Kuşkaya & Mumcu (2011)	Mixed Methods (Convergent Parallel Design)
Orhan (2015)	Mixed Methods (Sequential)
Eren & Yurtseven-Avcı (2016)	Qualitative (Case Study)
Beisel (2017)	Qualitative (Case Study)
Joubert & Callaghan (2019)	Qualitative (single holistic case study)
Uluuysal & Kurt (2022)	Qualitative (Design-Based Research)
Günay-Kılıç (2023)	Mixed Methods (Embedded Design)
Hsu, Cheah & Hughes (2023)	Qualitative (Single Case Study)

Table 7 reveals that qualitative research methods are more popular, while mixed research methods come second. Overall, by considering the PICOS framework, the findings emerged from the eight studies in focus reveal that the TIP model helps teachers and undergraduate students majoring in education systematically manage the process of integrating technology into their courses on the basis of pedagogical goals. However, teachers need support in structural and time management dimensions for the sustainability of the usability of this model (Eren & Yurtseven-Avcı, 2016). The fact that the studies were limited to undergraduate students, novices, and experienced teachers was a limitation for the applicability of the model at the K-12 level.

Discussion and Results

The present systematic review examined empirical and theoretical applications of the Technology Integration Planning (TIP) Model, originally developed by Roblyer (2006), across eight studies identified through a comprehensive database search. The findings are discussed below in relation to the research questions guiding this review, with particular attention to patterns, gaps, and epistemological implications emerging from the evidence base.

A notable geographical concentration was observed among the included studies, with more than 60% conducted in Türkiye. While this pattern may reflect the relatively greater scholarly familiarity with the TIP Model within Turkish academic contexts, particularly within departments of Computer Education and Instructional Technology, it simultaneously constrains the generalizability of the findings to other national and cultural settings. The predominance of a single country in the evidence base raises epistemological concerns regarding whether the model's applicability and effectiveness can be assumed to transcend the specific institutional, curricular, and technological infrastructures within which these studies were conducted. Future research conducted across diverse geographical and cultural contexts is therefore essential to establish the international validity of the model.

The distribution of publication types across the included studies, encompassing peer-reviewed journal articles, graduate theses, and in-depth scholarly investigations, suggests that the TIP Model has attracted attention at both applied and theoretical levels of inquiry. This breadth of engagement may be interpreted as indicative of the model's perceived conceptual utility; however, the limited overall volume of research precludes definitive conclusions regarding the robustness of its theoretical foundations or the consistency of its practical outcomes across varied educational settings.

With respect to participant characteristics, the majority of studies focused on preservice teachers enrolled in faculties of education, with a smaller number of engaging practicing teachers at varying stages of professional experience. This pattern reflects the model's intuitive alignment with teacher education and professional development contexts, given its structured approach to pedagogical planning and technology selection. Nevertheless, the near absence of studies examining the TIP Model's application with learners across different age groups or educational levels constitutes a substantive gap in literature. The overrepresentation of teacher-focused samples limits the extent to which conclusions can be drawn regarding the model's impact on student learning outcomes, a dimension that warrants systematic investigation in future research.

The technological tools most frequently employed within TIP Model-based studies were Web 2.0 applications and hardware-based technologies such as interactive whiteboards, tablets, and computers. This finding reflects the broader technological landscape prevalent during the period in which most of the included studies were conducted. Notably, emerging technologies such as augmented reality and virtual reality remain largely absent from the evidence base, representing a significant gap at the intersection of innovative technology integration and model-based instructional planning. The incorporation of such technologies within the TIP Model framework offers a promising avenue for future inquiry that could simultaneously advance both domains.

The predominance of mixed-method and qualitative research designs across the included studies is epistemologically consistent with the process-oriented nature of the TIP Model, which encompasses the holistic stages of instructional preparation, implementation, and evaluation. Qualitative approaches are particularly well suited to capturing the nuanced experiences, planning strategies, and perceived challenges of participants engaged in technology integration processes. However, the relative scarcity of quantitative and experimental designs limits the extent to which causal claims regarding the model's effectiveness can be substantiated. The absence of psychometrically validated instruments designed specifically to measure TIP Model outcomes further compounds this methodological limitation, and the development of such measures represents a clear priority for the field.

The substantive findings across the included studies converge on the conclusion that engagement with the TIP Model is associated with meaningful improvements in teachers' and preservice teachers' technology integration knowledge, attitudes, and competencies. Gains were particularly evident in the domains of instructional planning, technology selection, and pedagogical alignment, all of which correspond directly to the structural phases of the model as conceptualized by Roblyer (2006). These outcomes are theoretically consistent with the TPACK framework, insofar as the TIP Model may be understood as a procedural scaffold that enables practitioners to operationalize the integration of technological, pedagogical, and content knowledge in a structured and reflective manner. In the study conducted by Aktaş and Özmen (2020), the three stages of the model were implemented sequentially, beginning with the alignment of technology and content, proceeding through pedagogical planning, and culminating in implementation and evaluation, with results providing empirical support for the integrative process envisioned by the model. However, several studies reported implementation difficulties, particularly at the stages of assessment design and decision-making, suggesting that the model's adoption is neither uniform nor straightforward and may be substantially shaped by contextual factors such as the level of institutional support available to practitioners and their prior experience with technology-enhanced instruction. The findings of Eren and Avcı (2016) are particularly instructive in this regard, as they demonstrate how factors such as curriculum demands, time constraints, and inadequate technical resources can impede full and sustained implementation of the model in authentic classroom settings. Taken together, these findings underscore the importance of systemic institutional support and targeted professional development as preconditions for effective TIP Model adoption.

The patterns identified across the included studies suggest that while the TIP Model (Roblyer, 2006) demonstrates meaningful potential as a framework for supporting technology integration and pedagogical decision-making, the current evidence base remains insufficient to support broad generalizations. The concentration of studies within a single disciplinary and geographical context, the methodological predominance of qualitative designs, the limited diversity of participant populations, and the absence of longitudinal or large-scale quantitative investigations collectively constrain the scope of the conclusions that can be drawn. These observations are not merely methodological in nature; they reflect deeper epistemological limitations regarding the transferability of knowledge generated within this body of literature to other educational contexts. Accordingly, the present review identifies several substantive directions for future research, among them cross-national replication studies, the development of validated measurement instruments, and systematic investigation of the TIP Model's applicability within the context of rapidly evolving pedagogical technologies.

Limitations

The present systematic review is subject to several limitations that should be considered when interpreting its findings. First, the search was restricted to eight databases, namely YÖKTEZ, ProQuest Dissertations and Theses Global, Web of Science, ERIC, ScienceDirect, EBSCOhost, SpringerLink, and MDPI. Although the selected databases represent a broad and reputable cross-section of academic literature, the possibility that pertinent empirical work published elsewhere remains unaccounted for cannot be entirely ruled out.

Second, the review was limited to studies published in English and Turkish, which may have introduced a degree of language bias. Studies conducted and disseminated in other languages were not included in the screening process, and it is plausible that a body of relevant scholarship exists in other linguistic contexts that could have enriched the synthesis.

Third, and most notably, only eight studies met the predetermined inclusion criteria, resulting in a relatively small evidence base. As discussed elsewhere in this review, this paucity of sources is interpreted as indicative of a broader lacuna in the extant literature pertaining to the model under investigation, rather than as a reflection of methodological inadequacy. Nevertheless, the limited number of included studies constrains the extent to which generalizable conclusions can be drawn.

Finally, the screening and selection process was conducted by a single reviewer, which represents a methodological limitation with respect to the minimization of selection bias. This limitation is acknowledged in accordance with established standards for systematic review methodology (Page et al., 2021).

Conclusion

The present systematic review set out to examine the scope, characteristics, and findings of empirical research employing the Technology Integration Planning (TIP) Model, originally developed by Roblyer (2006), as a theoretical or methodological framework. Through the systematic screening of eight databases and the application of rigorous inclusion and exclusion criteria in accordance with the PRISMA 2020 protocol, eight studies were identified as meeting the criteria for inclusion. Although the limited size of the evidence base reflects the nascent state of scholarship in this area, the findings of the review nonetheless yield meaningful insights into both the current applications of the model and the directions in which future research must develop.

The reviewed studies collectively indicate that the TIP Model (Roblyer, 2006) offers a structured and theoretically coherent framework for supporting technology integration across diverse educational contexts, particularly within teacher education and professional development settings. The empirical evidence accumulated across the included studies points to consistent gains in practitioners' technology integration competencies, instructional planning abilities, and pedagogical decision-making capacities, as demonstrated most clearly in the work of Aktaş and Özmen (2020). At the same time, the evidence base reveals a series of persistent gaps, including limited geographical diversity, an overreliance on qualitative methodologies, insufficient engagement with emerging technologies, and a near-absence of learner-centered outcome data, all of which circumscribe the generalizability of existing findings and point to clear priorities for future investigation.

The paucity of studies meeting the inclusion criteria is itself a significant finding. Rather than reflecting a methodological constraint of the present review, this scarcity is interpreted as indicative of a broader lacuna in the extant literature, suggesting that despite its conceptual contribution to the field of educational technology, the TIP Model has yet to receive the sustained empirical attention it warrants. The constraints identified by Eren and Avcı (2016), particularly with respect to the institutional and contextual conditions necessary for full model implementation, further highlight the need for research that moves beyond documenting the model's application to critically examining the conditions under which it can be most effectively and equitably adopted.

It is anticipated that the present review will serve as a foundational reference for researchers seeking to situate future work within this domain and that it will stimulate further primary research aimed at consolidating and extending the evidence base. Future studies are encouraged to adopt cross-national and mixed-method designs, to engage with diverse participant populations spanning different educational levels and disciplinary contexts, and to examine the model's applicability in relation to rapidly evolving technological landscapes. The development of psychometrically validated instruments capable of measuring TIP Model outcomes with precision and consistency would further strengthen the methodological foundations of this emerging body of scholarship. The ultimate aim of such a research agenda would be to establish a more robust, generalizable, and epistemologically sound body of knowledge regarding the role of the TIP Model in advancing effective and equitable technology integration in educational practice.

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