

MAPPING INSTRUCTIONAL DESIGN MODELS IN EDUCATIONAL PRODUCT DEVELOPMENT : A PRISMA-BASED QUALITATIVE META-ANALYSIS

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ABSTRACT

The rapid growth of educational technology has increased the need for appropriate instructional design models in educational product research and development (R&D). This qualitative meta-analysis maps the use of five widely adopted models--ADDIE, Kemp, Dick and Carey, Borg and Gall, and Gagné--in educational product development studies published from 2020 to 2025. Scopus-indexed articles were used as the data source because they provide peer-reviewed publications, internationally comparable metadata, and sufficient bibliographic consistency for transparent PRISMA-based screening. The study identified 335 records and retained 240 articles that met the inclusion criteria. Data were analyzed through narrative synthesis by coding the instructional design model, product type, research method, author characteristics, and implementation pattern. The findings show that ADDIE and Borg and Gall are the most frequently used models, especially in R&D studies and in the development of digital learning media, learning resources, and instructional products requiring staged validation. Dick and Carey, Gagné, and Kemp appear less frequently and are generally applied in more specific instructional contexts. These findings indicate that model selection is shaped by research objectives, product scale, development complexity, and reporting demands. The study contributes a comparative reference for selecting instructional design models in educational product development.

Keywords: Qualitative Meta-Analysis, Instructional Design, ADDIE, Borg and Gall, Research and Development, PRISMA.

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INTRODUCTION

Digital transformation has made innovation in learning products increasingly central to educational practice. Educational institutions now require digital modules, videos, e-worksheets, podcasts, interactive multimedia, and platform-based learning resources that are not only attractive but also pedagogically valid. In this context, instructional design models serve as methodological frameworks for planning, developing, validating, and evaluating educational products. The five models examined in this study--ADDIE, Kemp, Dick and Carey, Borg and Gall, and Gagné--were selected because they are among the most frequently cited models in educational product development and represent different design orientations: linear development, flexible design, systematic instructional analysis, large-scale R&D, and event-based instructional sequencing (Rahayu, 2025).

ADDIE is widely adopted because its stages are procedural and adaptable to various forms of learning media. Previous studies indicate that ADDIE supports needs analysis, instructional design, prototype development, implementation, and evaluation in a systematic manner (Muna & Wardhana, 2021; Sulastri et al., 2024). The model has been used to develop digital pocket books, mathematics learning media, and audio-based learning products such as podcasts, demonstrating its applicability across visual, digital, and audio learning formats (Rustandi & Rismayanti, 2021; Hanum et al., 2023).

Other instructional design models also have distinct contributions. The Kemp model offers a flexible and non-linear design structure; Dick and Carey emphasizes detailed instructional analysis and measurable learning outcomes; Borg

and Gall is commonly used in large-scale R&D because it includes iterative trials and revisions; while Gagné's Nine Events of Instruction provides a sequential framework for designing learning experiences, especially in multimedia and digital contexts (Hidayat & Tarsono, 2020; Setyawan & El Hakim, 2023; Putri et al., 2023; McNeill & Fitch, 2023). These differences make the five models suitable for comparative mapping because each model reflects a different logic of instructional product development.

Although systematic reviews and bibliometric studies on instructional design have increased, many of them focus on a single model, a particular technology, or citation trends. Few studies have compared how several instructional design models are actually used across educational product development studies, especially in relation to product type, research method, author demographics, and model implementation patterns. This study therefore differs from previous reviews by emphasizing qualitative synthesis of implementation characteristics rather than merely counting publications or describing one model in isolation.

A PRISMA-based qualitative meta-analysis is relevant because it enables a transparent and traceable synthesis of studies with diverse methodological designs. Through this approach, common patterns can be identified across studies without reducing the analysis only to statistical effect sizes. The growing demand for digital learning products such as e-modules, e-worksheets, augmented reality media, interactive H5P, and learning management systems further reinforces the need to understand which development

model is most appropriate for particular product characteristics and research objectives.

Based on this background, the study aims to conduct a qualitative meta-analysis of the use of ADDIE, Kemp, Dick and Carey, Borg and Gall, and Gagné in educational product development research published between 2020 and 2025. Specifically, this study seeks to identify the most frequently used instructional design models, map the types of products developed through each model, and analyze the suitability between model characteristics, research methods, and product development needs.

The findings are expected to provide conceptual and empirical references for researchers and practitioners in selecting instructional design models that are methodologically appropriate, contextually relevant, and aligned with the scale and objectives of educational product development.

RESEARCH METHOD

This study employed a qualitative meta-analysis guided by the PRISMA 2020 reporting framework. The approach was selected because the study aimed to synthesize implementation patterns rather than calculate statistical effect sizes. The analysis focused on educational product development studies that applied ADDIE, Kemp, Dick and Carey, Borg and Gall, and Gagné as instructional design models. These models were analyzed in relation to the type of product developed, research method, model implementation pattern, and reporting characteristics.

The data source was limited to Scopus-indexed journal articles published between 2020 and 2025. This limitation was applied

to ensure that the reviewed studies had undergone peer review, had standardized bibliographic metadata, and could be screened consistently through a transparent search procedure. Although this scope does not represent all educational product development studies, it provides a controlled corpus for mapping international publication trends.

The inclusion criteria were: (1) studies that explicitly used one or more of the five instructional design models; (2) studies conducted in formal or non-formal educational contexts at school or higher education levels; (3) Scopus-indexed or international peer-reviewed publications published from 2020 to 2025; and (4) studies that reported the development process, product type, and evaluation results with sufficient clarity. The exclusion criteria were: (1) publications that did not use an instructional design model; (2) opinions, editorials, proceedings without peer review, and popular articles; and (3) studies that did not explain product development stages or evaluation procedures.

The literature search used five keyword combinations: "ADDIE and development", "Kemp and development", "Dick and Carey and development", "Borg and Gall and development", and "Gagné and development". The search results were exported with bibliographic metadata, then screened through title, abstract, keywords, and full-text examination. Duplicate records and irrelevant articles were removed before eligibility assessment.

The selection process followed PRISMA stages: identification, initial screening, eligibility assessment, and final inclusion. During identification, all records obtained from the database were documented. During screening, irrelevant

studies and duplicates were excluded. During eligibility assessment, full texts were read to confirm the presence of the development model, product type, and evaluation evidence. The final dataset consisted of articles that met all inclusion criteria.

Quality appraisal was conducted using a narrative checklist developed for this study. The checklist examined five aspects: clarity of research objectives, explicit identification of the instructional design model, completeness of development stages, clarity of product evaluation, and adequacy of reporting. Articles that did not provide sufficient methodological information were excluded from the synthesis. This process was intended to reduce the risk of including studies with weak procedural transparency.

The coding process used a codebook prepared before data extraction. The codebook included categories for instructional design model, year of publication, author country of origin, number of authors, research method, product type, implementation type, development stages, and evaluation characteristics. Coding was conducted independently by two researchers. Differences in coding were compared, discussed, and resolved through consensus to ensure consistent interpretation of the data.

Inter-coder agreement was examined through direct comparison of coding results before consensus discussion. The agreement check was used to identify inconsistent interpretations of model categories, product types, and implementation patterns. When disagreement occurred, the researchers returned to the full text of the article and revised the coding based on the operational definitions in the codebook.

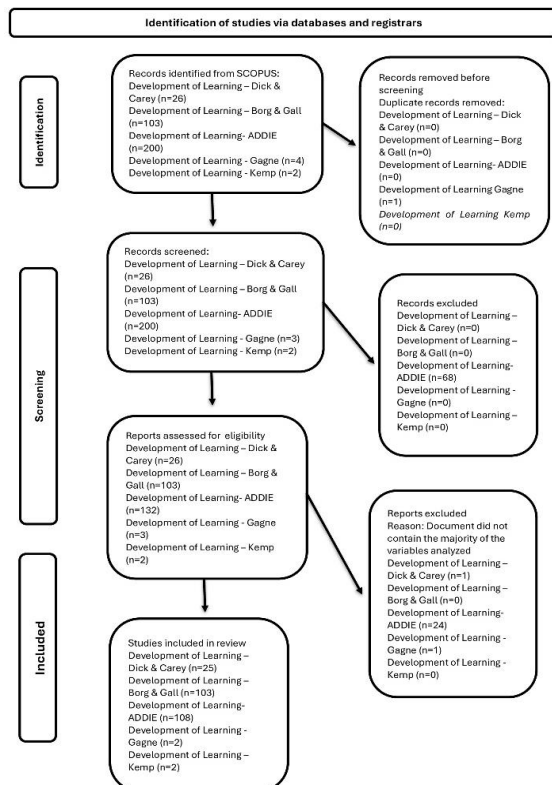
Data were analyzed using qualitative narrative synthesis. The analysis involved coding and categorization, identification of recurring patterns, thematic synthesis, and comparison between models. The synthesis emphasized model flexibility, methodological suitability, implementation characteristics, and contextual relevance in educational product development.

RESULT AND DISCUSSION

The PRISMA procedure served as the methodological basis for ensuring that the identification, screening, eligibility assessment, and final inclusion of studies were conducted transparently and consistently. This procedure is important because studies on instructional design models vary considerably in terms of terminology, product type, research design, and reporting detail. By using PRISMA, the selection process can be traced from the initial database search to the final corpus used for synthesis (Page et al., 2021).

In this study, PRISMA was not only used as a reporting format but also as a control mechanism to reduce selection bias. The use of explicit inclusion and exclusion criteria helped ensure that the synthesis focused on studies that genuinely developed educational products and provided sufficient evidence of model implementation.

The diversity of ADDIE, Dick and Carey, Borg and Gall, Kemp, and Gagné studies required careful screening because some articles used model names only as labels without explaining development stages. Therefore, methodological transparency became a key consideration in determining eligibility.



As shown in Figure 1, the initial search identified 335 records related to the five instructional design models: ADDIE (n=200), Borg and Gall (n=103), Dick and Carey (n=26), Gagné (n=4), and Kemp (n=2). After duplicate removal, relevance screening, and eligibility assessment, 240 articles were retained for final synthesis. This result indicates that ADDIE appears most frequently in the initial search results, followed by Borg and Gall, while Kemp and Gagné are represented by a much smaller number of studies.

The dominance of ADDIE can be interpreted methodologically. ADDIE is often preferred because it provides a clear, manageable, and easily reported sequence of development stages. This makes it attractive for researchers who need a practical framework for designing learning media, validating products, and reporting R&D procedures in academic publications (Muna & Wardhana, 2021).

The lower frequency of Kemp and Gagné does not necessarily indicate that these models are less valuable. Rather, it suggests that their use is more context-dependent. Kemp is more suitable when development requires flexibility and cyclical adjustment, while Gagné is often chosen when the focus is on structuring instructional events and learner engagement in a specific learning sequence.

Several articles were excluded because they did not focus on educational product development, did not clearly describe the instructional design model, or lacked evidence of product evaluation. This finding reinforces the importance of complete methodological reporting in R&D studies. Without sufficient procedural detail, it becomes difficult to assess whether a model was implemented substantively or merely mentioned as a formal reference.

Thus, the PRISMA results show both the popularity of particular models and the uneven quality of reporting in instructional design research. The final corpus of 240 articles provides a more reliable basis for interpreting the actual use of development models in educational product research.

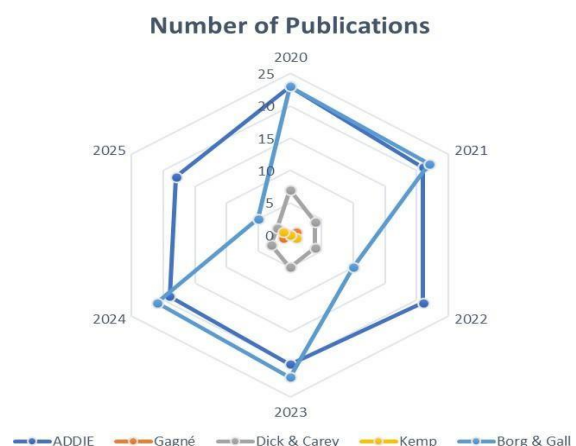


Figure 2. Number of Publications of each instructional design model

The publication trend in Figure 2 shows that ADDIE and Borg and Gall consistently dominate educational product development research from 2020 to 2025. This pattern is not merely a matter of popularity; it reflects the methodological compatibility of both models with the structure of R&D research. ADDIE offers a concise and operational sequence that can be adapted to small- and medium-scale products, while Borg and Gall provides a more comprehensive structure for products requiring repeated field trials and revisions.

The strong presence of Borg and Gall is particularly relevant for product development studies that emphasize validation, feasibility testing, and effectiveness evaluation. Its iterative character allows researchers to revise products based on expert judgment and user feedback, making it suitable for large-scale educational innovations (Putri et al., 2023; Bakir & Sukiman, 2024).

By contrast, Dick and Carey, Gagné, and Kemp appear less frequently because their use often requires more specific instructional purposes. Dick and Carey demands detailed instructional analysis, Gagné emphasizes the sequencing of learning events, and Kemp provides flexible design elements that may not always fit the linear reporting format preferred in many R&D articles. Therefore, their lower frequency should be understood as a matter of contextual suitability rather than methodological weakness.

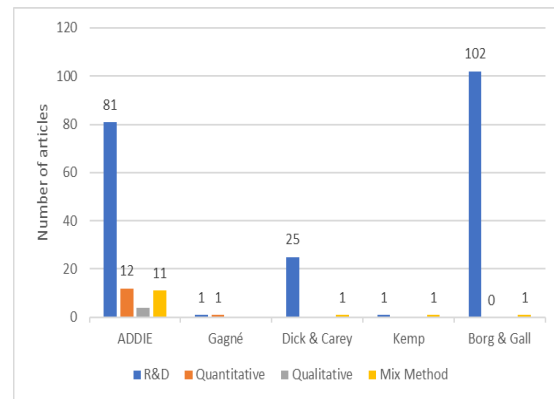


Figure 3 Type of research of each instructional design model studies, followed by quantitative (12)

Figure 3 further indicates that ADDIE and Borg and Gall are strongly associated with R&D-oriented studies. ADDIE recorded the highest number of articles in R&D studies, followed by quantitative, qualitative, and mixed-method designs. This distribution suggests that ADDIE is perceived as a practical model for studies that require clear development stages but do not always require extensive field testing.

Borg and Gall shows a particularly high frequency in R&D studies because its structure is aligned with product validation, revision, and field testing. The model is therefore more frequently used when the research objective is not only to design a product but also to test its feasibility and effectiveness through systematic development cycles.

The more limited use of Dick and Carey, Gagné, and Kemp in R&D studies can be explained by their instructional specificity. Dick and Carey is more appropriate for research that requires detailed analysis of learning objectives and assessment alignment. Gagné is appropriate for designing multimedia or digital learning experiences with explicit instructional events. Kemp is useful in flexible learning design contexts, although its non-linear

nature may make it less straightforward to report in conventional R&D formats.

Overall, the distribution of research types shows that researchers tend to select instructional design models that are easy to operationalize and align with publication reporting requirements. This explains why procedural models, especially ADDIE and Borg and Gall, are more visible in Scopus-indexed educational product development studies.

The pattern also indicates a methodological preference in educational technology research: models with explicit stages are more likely to be adopted because they support transparent product development, expert validation, and user testing. This reinforces the argument that model selection is shaped by the interaction between research objectives, The demographic distribution shows that most articles were written by domestic authors (75.4%), while international and collaborative publications were less frequent. This pattern suggests that educational product development research remains strongly shaped by local educational needs, curriculum demands, and institutional contexts. However, the limited proportion of international collaboration may reduce the diversity of perspectives in comparing instructional design practices across countries.

The detailed distribution is: for author origin, domestic articles consisted of ADDIE 54, Gagné 1, Dick and Carey 23, Kemp 2, and Borg and Gall 101 (75.4%); collaborative articles consisted of ADDIE 13, Dick and Carey 2, and no Gagné, Kemp, or Borg and Gall articles (6.3%); and international articles consisted of ADDIE 40, Gagné 1, and Borg and Gall 2 (17.9%). For the number of authors, publications with

one to three authors were distributed across ADDIE 42, Gagné 2, Dick and Carey 15, Kemp 0, and Borg and Gall 50 (45.4%), while publications with more than three authors consisted of product scale, and expected evidence of product quality (Abuhassna et al., 2024).

Nevertheless, the selective use of Dick and Carey, Gagné, and Kemp provides an important theoretical reminder. Instructional design should not be reduced to procedural compliance; it must also consider instructional logic, learner characteristics, learning sequence, and the complexity of the product being developed.

Consequently, the findings suggest that no model is universally superior. The appropriateness of each model depends on the type of learning problem, the expected product, and the depth of instructional analysis required by the study.

ADDIE 66, Dick and Carey 10, Kemp 2, and Borg and Gall 53 (54.6%). Single-model implementation dominated with ADDIE 108, Gagné 2, Dick and Carey 17, Kemp 1, and Borg and Gall 99 (94.6%), whereas combined-model implementation appeared in Dick and Carey 8, Kemp 1, and Borg and Gall 4 articles (5.4%).

In terms of authorship, more than half of the publications involved teams of more than three authors. This finding is understandable because R&D studies often require collaboration among experts in instructional design, subject matter, media development, and evaluation. Larger teams can strengthen product development, but they also require clear role distribution and transparent documentation of author contributions.

The implementation pattern also shows that most articles applied a single instructional design model rather than a

combined model. This indicates that researchers generally prefer methodological clarity over hybrid design. While single-model implementation supports easier reporting, combined-model approaches may offer richer design possibilities when development problems

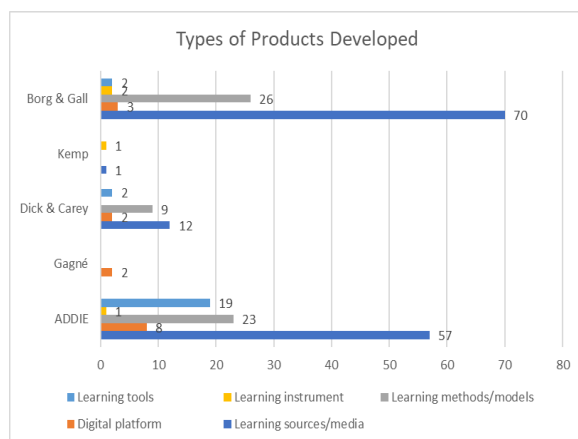


Figure 4 Type of products developed of each instructional design model

The product-type analysis in Figure 4 shows that Borg and Gall and ADDIE dominate the development of learning resources and media. This dominance is theoretically consistent with the nature of both models. Borg and Gall is suitable for products that require iterative trials and revisions, while ADDIE is suitable for products that require a clear sequence from needs analysis to evaluation. Digital modules, videos, e-worksheets, and interactive multimedia are therefore commonly developed using these two models (Sulastris et al., 2024; Muna & Wardhana, 2021).

In the category of learning methods or models, Borg and Gall again appears prominently, followed by ADDIE and Dick and Carey. This pattern indicates that developing learning methods often requires broader validation and repeated testing, which aligns with the iterative logic of Borg

and Gall. Meanwhile, Dick and Carey is relevant when the product emphasizes instructional objectives, learning strategies, and assessment alignment.

For learning tools, ADDIE remains useful because it supports prototype development and gradual validation. Products in this category may include digital teaching aids, simulations, experiment kits, or demonstration tools that require practical testing and expert review before classroom implementation (Rustandi & Rismayanti, 2021).

In the digital platform category, ADDIE also remains dominant, followed by Gagné and Dick and Carey. Digital platforms such as learning management systems, web-based applications, and interactive platforms require not only technical development but also coherent instructional flow. This explains why models with clear design stages and instructional sequencing are often preferred.

The relatively limited contribution of instructional design models to learning instrument development suggests that measurement tools may require evaluation-oriented models rather than product-development models. Instrument development often demands validity and reliability testing procedures that differ from the design of learning media or platforms (Nurrahman et al., 2023; Zinnurain, 2024).

Taken together, the findings show that the use of instructional design models is shaped by practical, methodological, and theoretical considerations. ADDIE and Borg and Gall dominate because they are easier to align with R&D procedures and publication reporting requirements. However, models such as Dick and Carey, Gagné, and Kemp remain important when the research problem requires deeper instructional

analysis, specific sequencing of learning events, or flexible design adaptation.

These results confirm that model selection should be based on product characteristics, development scale, learner needs, and the type of evidence required. Therefore, the contribution of this study lies not only in identifying dominant models but also in clarifying why certain models are more frequently used in particular educational product development contexts.

CONCLUSION

Based on the qualitative meta-analysis of educational product development studies published from 2020 to 2025, this study concludes that the use of instructional design models is uneven across the reviewed literature. ADDIE and Borg and Gall are the most dominant models in Scopus-indexed publications because both provide clear, systematic, and operational stages that are compatible with R&D research. ADDIE is commonly used for digital learning media and learning resources, while Borg and Gall is more prominent in studies requiring iterative trials, validation, and product revision.

Dick and Carey, Gagné, and Kemp are used more selectively. Their lower frequency does not indicate lower theoretical value, but reflects their more specific design orientation. Dick and Carey is useful for detailed instructional analysis, Gagné for structured learning events, and Kemp for flexible and cyclical design. These findings emphasize that the effectiveness of an instructional design model depends on the research objective, product type, development scale, learner characteristics, and the researcher's ability to implement the model consistently.

This study has several limitations. First, the data source was limited to Scopus-indexed publications, so relevant studies from other databases may not have been included. Second, the analysis focused only on five instructional design models, although other models are also used in educational product development. Third, the quality appraisal was conducted through a narrative checklist rather than a formal statistical risk-of-bias instrument. Future studies are therefore encouraged to include multiple databases, expand the range of instructional design models, and apply a more detailed quality appraisal procedure. Despite these limitations, the findings provide a useful reference for researchers and practitioners in selecting instructional design models that are contextually appropriate and methodologically accountable.

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