

Development of Effective Instructional Teaching Module in Tvet: A Comparative Review of Addie and Nedham's 5 Phases Instructional Design Model

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Abstract

Instructional design is a constantly changing field in education and training. The ADDIE technique, which encompasses the stages of Analysis, Design, Development, Implementation, and Evaluation, has gained widespread use in educational resource creation since its introduction. This article thoroughly examines the ADDIE and Needham 5-phase models and their implementations in technical and vocational education and training (TVET). The research examines the similarities and distinctions among these approaches and their benefits and drawbacks in creating efficient teaching materials for TVET students. In addition, the study analyses the latest developments and modifications of these models, including the incorporation of technology and focused methodologies, and presents instances of their implementation in diverse settings. The article evaluates the efficacy of these models in various learning environments and topic domains in technical and vocational education and training (TVET) aiming at potential areas for further study advancement and development.

Keywords: ADDIE Model, Needham 5 Phases Model, Instructional Design, TVET, Teaching Module

Introduction

Technical and Vocational Education and Training (TVET) has emerged as a key component of workforce development quickly changing the economy of today globally, giving people the abilities, know-how, and practical skills required to thrive in a variety of fields. To guarantee that students not only understand theoretical concepts but also gain practical experience that equips them for challenges in the real world, TVET must build efficient instructional teaching modules. In light of TVET's critical role in promoting economic growth and mitigating skills

gaps across multiple industries, it is imperative to investigate the best practices for developing and executing instructional modules that optimize student learning.

A module is a structured learning resource that includes content, methods, guidelines, and processes, designed systematically and creatively to help learners achieve the required competencies at a specific level of complexity (Hendriyani et al. 2021; Linda et al. 2018). The perspective makes it abundantly evident that using the module is essential to the learning process (Nurkaliza et al, 2015). In the context of education, teaching modules are crucial because they are highly structured and organized learning resources that support learning objectives and success metrics by delivering content methodically. They enhance the quality of education and increase the effectiveness of instruction, and their importance must be acknowledged by educators and students (Hashim et al., 2022). When creating an effective teaching module, a teacher needs to adhere to specific learning principles, assessment criteria, and claims (Kadek, 2022a). It continues by stating that the following requirements must be met for an independent curriculum teaching module: central concepts, interesting and thought-provoking content, pertinent and contextualised data, and an ongoing series of learning activities that cater to the needs of students at every learning stage. Learning objectives, assessments, opening questions, activities, and reflection for both teachers and students are the main elements of the lesson plan (Kadek, 2022b). Teaching materials are one of the crucial components in the learning process.

The correct instructional materials must support the smooth functioning of learning activities. The usage of instructional materials needs to be tailored to the conditions and characteristics of students. Designing or producing teaching materials requires an appropriate development model to ensure the quality of teaching materials and support the learning process. Effective teaching in Technical and Vocational Education and Training (TVET), talk about the relevance of module and ADDIE MODEL: The ADDIE (Analysis, Design, Development, Implementation, and Evaluation) paradigm is one of the most often used instructional design frameworks in TVET. This concept was initially presented in the 1970s and has been widely used in several sectors, including education. The ADDIE paradigm provides a systematic framework for instructional designers to construct successful teaching modules. The ADDIE paradigm, for example, has been extensively adopted and acclaimed for its flexibility and comprehensive approach to instructional design. The ADDIE model is flexible and enables the instructional designer to customise the model according to the learners' requirements and the learning environment's circumstances (Iftitah, 2023). The Needham 5phases model, while less commonly recognised than the ADDIE model, has also acquired favour in recent years owing to its emphasis on a systematic approach to instructional design. The Needham Five Phases has been used in a few literary works, but there is inadequate literature in this area. This study addresses these challenges by creating a module and evaluating its effectiveness, using a constructivist teaching approach in place of more conventional teaching methods can effectively address the alternative framework. Needham's Five Phases Constructivism Model is an extremely successful teaching and learning (Surif et al., 2014a). Throughout, teaching and learning actively support students in broadening their understanding. Yunos et al., (2020), emphasized that the model is among the greatest concepts for teaching and learning. The ADDIE and Needham's 5phase models have their pros and weaknesses, and the decision to utilise one over the other will depend on the individual learning goals and classroom environment. However, both approaches give a methodical approach to instructional design

that can assist in ensuring an effective teaching module in technical and vocational education and training.

Technical and Vocational Education and Training (TVET), aims to develop individuals with ethical principles, practical skills, and knowledge to advance society (Jinxu Shao, 2022). The National Policy on Education (2004), encompasses the study of technology and associated sciences, acquisition, information, attitudes, and practical skills pertinent to many jobs within the economy and society. The policy aims to supply skilled labour in applied science and business, impart technical and vocational skills for commercial, agricultural, and economic development, and prepare people for economic independence. High vocational schools must prioritise hands-on learning to achieve these objectives. TVET aims to develop individuals capable of societal growth, moral principles, and survival skills. High vocational schools should maximize practical teaching, improve students' quality, and assist them in developing the necessary skills (Nkwachi, 2018). The applications of the Addie model in designing digital teaching materials may aid in building and compiling good and effective digital teaching materials for use in the learning process and systematically applied (Martatiyana et al., 2023). The constructivism technique in learning the reading component is deemed to have the potential to meet learning objectives (Hasanah Dewi Lestari, 2023). If this approach is implemented appropriately which is reinforced by teaching materials particularly created for instructional materials that contain constructivist stages in learning are predicted to accomplish the intended learning results (Hamidah, 2023).

Effectiveness of Instructional Module in TVET

In the context of this article, it refers to an instructional method teaching module based on efforts to help students overcome problems in constructing the ideas, and concepts that should be implemented in the method of teaching. This is how effective the module developed based on ADDIE and Needham's 5phases model. Through the systematic delivery of content, these modules seek to meet predetermined learning objectives and success metrics (Kadek, 2022b). Likewise, educators and learners alike must acknowledge the significance of instructional modules, as they contribute to increasing the effectiveness of instruction, guaranteeing a methodical distribution of content, and elevating the general calibre of the educational process. According to this (Kadek, 2022b), a teacher must follow certain learning principles and assessment criteria to create an effective teaching module.

Finally, the use of teaching modules has become increasingly important providing new opportunities for innovative and effective teaching practices. However, the development and implementation of teaching modules must be approached with care and should be guided by a structured approach to instructional design. The ADDIE and Needham 5 phases models provide effective frameworks for designing and implementing teaching and learning that can help ensure the success of the TVET program.

The Definition of the Term Used in the Study

The definition of several key terms and concepts associated with instructional design models is essential to promoting a clear understanding of the subjects discussed in this review article. These definitions will help clarify the foundational elements of instructional design teaching models covered in the review article.

1. Instructional design refers to the organised process of creating educational and training programs, courses, and materials aimed at achieving specific learning goals. This process includes assessing learners' needs, crafting effective instructional strategies, developing learning resources, delivering the instruction, and evaluating its overall effectiveness (Iftitah, 2023).
2. An instructional design ADDIE model is a structured framework that offers a methodical approach to creating and developing instructional materials. It usually involves several essential phases, including analysis, design, development, implementation, and evaluation.
3. Instructional teaching module encompasses any materials, tools, or resources used to facilitate and enhance the teaching and learning experience. These can include textbooks, videos, interactive software, online resources, and other materials designed to aid learning.
4. The modules typically contain learner-centred activities, varying depending on the course and learners' level. In this article, the module aims to improve teaching and learning by creating lesson plans, illustrating student learning, outlining learning objectives, and allowing students to demonstrate their understanding.
5. Technical and Vocational Education and Training (TVET): This article explores the definitions of the Federal Republic of Nigeria's National Policy of Education (FRN, 2004). TVET encompasses general education, technology studies, and skill development for various professions in social and economic settings. It is a curriculum tailored to learners' specific work needs.

By defining these key terms and concepts, this review seeks to offer a clear and concise understanding of the topics discussed, enabling effective communication and analysis of the two instructional design models and their application for the development of teaching modules.

Definition of ADDIE Model Instructional Design

Creating a course and using it professionally, is known as instructional design. (Tazhina et al., 2021). To evaluate the two concepts of instructional design according to the dictionary meaning, the term “design” relates to the “outer appearance”, to “the way a thing is presented, and a blueprint is a graphic depiction of a building's or product's intended construction, appearance, and operation. However, “knowledge, skills and abilities taught to someone or acquired by someone, through which the acquisition of general culture and a professional specialisation is aimed to allude adjective instructional design”(Halder & Saha, 2023).

The field of instructional design is concerned with creating training activities, and outlining the phases and actions required to accomplish them. Its goal is to enhance the quality of teaching-learning activities by better tailoring them to the needs and characteristics of the target audience.(Halder & Saha, 2023)

Objective and Extent of the review article

The objective of this review study is to assess and contrast two prevalent instructional design models, namely the ADDIE model and the Needham 5 stages model, and to evaluate their use in the development of teaching modules in technical and vocational education and training (TVET). This study seeks to offer TVET educators and instructional designers a

comprehensive understanding of these two models, including their fundamental elements and procedures, as well as the benefits and drawbacks of employing them in Technical and Vocational Education and Training (TVET). Furthermore, this study aims to conduct a thorough examination of the two models in the context of Technical and Vocational Education and Training (TVET), specifically focusing on their advantages and disadvantages. Additionally, it aims to identify potential enhancements that may be made to better cater to the requirements of TVET students. This study intends to contribute to the continuing conversation on the optimal design of teaching modules for Technical and Vocational Education and Training (TVET) students. Finally, it seeks to emphasize the growing trends in utilised instructional design models in vocational education and training.

Significance of the Study

For many stakeholders in the educational and vocational domains, especially in the field of Technical and Vocational Education and Training (TVET), this study is extremely important. It seeks to offer a thorough analysis of two important instructional design models, Needham's 5 Phases and ADDIE, both of which can greatly affect the standard of instruction and training in TVET programs. It is anticipated that the study's findings will help teachers, curriculum designers, legislators, students, and the larger conversation on instructional design in technical education.

Industry and Employers

This study will have indirect benefits for employers and industries that depend on the trained workforce supplied by TVET institutions. This research guarantees that graduates are more equipped for the workforce by assisting educators and institutions in creating more effective educational modules. Employers today greatly value graduates with the ability to solve complex problems and adapt to new technologies, which may be achieved through well-designed instructional modules that emphasize both practical skills and critical thinking abilities.

Educators and Instructors

This study offers TVET educators insightful information about how to apply various instructional design methods to produce more engaging and successful teaching modules. TVET instructors will gain from knowing the advantages and disadvantages of both the ADDIE and Needham models since they frequently struggle to strike a balance between theoretical knowledge and real-world, hands-on learning. The results will direct them in choosing the best instructional framework to suit the various wants of their students, guaranteeing a more customized and learner-centred method of instruction.

Learners

The students certainly stand to gain the most from this study in the end. More effective teaching modules that are created with their unique learning requirements in mind can benefit TVET students, who frequently need a mix of theoretical knowledge and practical abilities. The study's comparison of two instructional design methodologies guarantees that the students' learning experiences will be more organized, interesting, and applicable to their future employment. In addition to improving learning outcomes, well-designed teaching modules will provide students with the tools they need to thrive in a labour market that is changing quickly.

Curriculum Developers and Instructional Designers

For the individuals working in vocational education curriculum creation and instructional design, this study is extremely significant. The research provides useful guidelines for creating educational materials that not only support industry standards but also encourage critical thinking and problem-solving abilities by contrasting the ADDIE and Needham models. These insights can be used by instructional designers to create modules that more effectively combine theoretical ideas with practical applications, improving the learning process and equipping students for the challenges of the workforce.

TVET Policymaker

This study has important policy implications for education planners and legislators who create regional and national policies for career education. The significance of Technical and Vocational Education and Training (TVET) in propelling economic expansion and workforce development is increasingly acknowledged. This study offers evidence-based perspectives that can guide governmental decisions about curriculum creation, teaching approaches, and teacher preparation programs. Policymakers may help create a trained workforce that can satisfy the demands of different industries by encouraging the use of effective instructional design models like ADDIE and Needham's 5 Phases.

Methodology

This study was done by undertaking a systematic review approach, including developing inclusion and exclusion criteria and processes for identification, examination, and eligibility determination. This was followed by data collecting and analysis. The survey approach employed Google Scholar, and Scopus databases to source for papers. The systematic review method involves several steps. Drawing on earlier research and thesauruses, pertinent and related keywords linked with the development of successful instructional teaching modules in TVET were selected. For this study, the chosen keywords utilized in a Google Scholar search were: "module development" OR "teaching" AND "TVET" and the keywords used in a Scopus search were: "Teaching module" OR "ADDIE" OR "Needham" AND "MODEL"

In the initial phase, 3,363 documents were found in Google Scholar and 281 in Scopus. A total of 3,644 articles were retrieved from the search database. The terminology employed was broad enough to encompass pertinent items while efficiently excluding less relevant ones. Subsequently, eligibility and exclusion criteria were established to include publications published from 2019 to 2024 and articles written in English. The remaining articles were evaluated and analysed by identifying studies that closely align with the research objectives. Data extraction involved reviewing the abstracts first and then thoroughly examining the entire article. Finally, an exclusion process was used to narrow the selection, ensuring that only the most relevant articles were included in the review. Specifically, the papers whose content was not in line with the ADDIE model and Needham 5 phases, and TVET teachers in automobiles were excluded after examining the entire articles. Finally, thirty-five articles were selected.

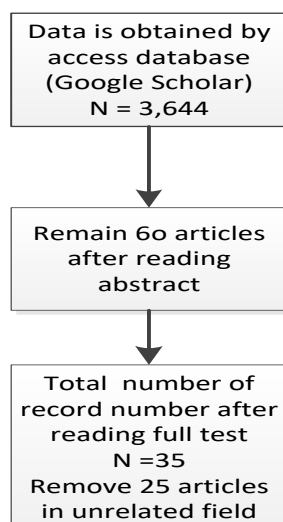


Figure 1. The research Process

Findings

The Role of the Instructional Design Model in Creating an Effective Instructional Module in TVET

The construction of modules was guided by the ADDIE model process which instructional designers and training developers frequently employ. The process encompasses analysis, design, development, implementation, and Evaluation. These processes represent dynamic and flexible guidelines for producing appropriate instructional aids. This technique was chosen because of its flexible components, which allow for the switching between traditional and personalised learning. The stages of the ADDIE model can also be combined with other models or altered to suit the needs of the intended users. The ADDIE model's phases can also be modified to meet the demands of the intended user and used in conjunction with other models.

The ADDIE model is a popular instructional design and development framework among training programmers and educational designers. It first appeared in 1975 at Florida State University (Spatioti & Kazanidis, 2022). The five pillars upon which this methodology rests when crafting the educational experience are driven by the outcomes of each phase in the ADDIE paradigm. Yet, this sequence's stages need not adhere to a strict, sequential order to achieve the author's status. Because it is both thorough and systems-oriented, the ADDIE method generates first-rate training module designs (Johnson-Barlow & Lehnen, 2021). The article uses the ADDIE paradigm educational modules and determines their efficacy. The instructional module created for technical and vocational education and training is the topic of discussion. The module's design is founded on theories and models that support teaching and learning, aid in students' acquisition of information and skills, encourage good attitudes in the classroom and heighten students' interest in teaching and learning (Abdullah et al., 2020). Furthermore, it is important to suggest the best teaching strategies to improve students' affectivity, knowledge, and abilities. Instructional modules are a very effective instrument for education and training in the TVET industry. For instructional modules to be successful, they must be created using well-established instructional design concepts. Instructional design models offer a framework for creating impactful instructional modules. They guide the instructional designer through a sequence of actions, starting from

understanding the learning requirements and concluding with evaluating the teaching module's efficacy (Iftitah, 2023).

In summary, the utilization of instructional design models is crucial for creating efficient instructional modules in technical and vocational education and training (TVET). These models offer a methodical and thorough approach to instructional design that may guarantee the module's alignment with the learning objectives and its suitability for the learners' developmental stage. By integrating instructional design models into the design process, it is possible to construct instructional modules that are both engaging and efficient, while also catering to the specific requirements of TVET students.

The results indicate that the flexibility and comprehensive structure of the ADDIE Model enables adaptation to cater to unique learner requirements, making it highly suitable for use in the TVET sector. The five steps of instructional design, namely Analysis, Design, Development, Implementation, and Evaluation, provide a systematic and organized approach, allowing for ongoing improvement at every level. Needham's Five Phases approach stresses student involvement and constructivist learning, promoting active participation and critical thinking via phases like as Orientation, Generation of Ideas, Restructuring of Ideas, Application, and Reflection. Although not as widely recognized as ADDIE, this approach helps promote a more profound comprehension among learners, especially in practical settings such as TVET. The findings indicate that both the ADDIE and Needham models are extremely efficient for instructional design, with each model presenting unique benefits based on the specific learning environment. Both methods are very suitable for developing modules in TVET, effectively addressing predetermined learning objectives and enhancing the quality of instruction.

Characteristics of Instructional Design

Reiser and Dempsey emphasized the following seven elements of instructional design: Instructional design encompasses the following principles: 1. It is learner-centered, meaning that instructional activities revolve around students' performance; 2. It is a goal-oriented process; 3. It is a creative process; 4. It is performance-focused; 5. It implies measurable, safe, and valid results; 6. It is empirical, iterative, and self-correcting; 7. It is a team effort, and the success of the instructional designer depends on their ability to collaborate with the other participants (Halder & Saha, 2023). Good teaching practices in distance education are the utilization of collaborative learning, active learning, social presence, and the supportive role of the instructor, including the provision of different learning experiences to enhance both the interaction and learning process in general, and finally the balancing of the amount of course information with the student's dedication and perseverance (Spatioti & Kazanidis, 2022). Utilizing collaborative learning, active learning, social presence, and the instructor's supportive role are all examples of good teaching practices in distance education. Other strategies include offering a variety of learning opportunities to improve interaction and the learning process overall, and, lastly, striking a balance between the course material and the student's commitment and perseverance (Halder & Saha, 2023).

Overview of the Addie instructional models in the Teaching Module in TVET

The ADDIE model's incorporation of technology facilitates improved student engagement, tailored learning opportunities, and the development of essential 21st-century

competencies including digital literacy and problem-solving. ADDIE models on information retention, skill development, and cognitive growth highlight the approach's transformational potential.(Spatioti & Kazanidis, 2022). Similarly, considering current research, the ADDIE model remains a foundational approach. The ADDIE model, which is an excellent example of the fundamental processes in the educational process of planning and implementing e-learning courses, may be found in the larger literature as a potential explanation for this (Draper-Rodi et al. 2018). Additionally, by fostering learners' positive attitudes and perceptions regarding the adoption and use of technology for educational purposes, the ADDIE model is thought to be appropriate for the design and implementation of mobile learning and is preferred for the development of virtual reality commands (e.g., Hanafi et al. 2020).

The ADDIE model is well-known and acknowledged as a model for creating and assessing learning experiences, courses, and educational content based on its fundamental theoretical and philosophical features (Spatioti & Kazanidis, 2022). Pedagogical situations form the basis of this concept. The foundation of the ADDIE model is the overall system's theory/analysis, which ensures that the analysis of tasks follows a logical and smooth process of the underlying theory for this model is the theory of behaviourism (Spatioti & Kazanidis, 2022). Regarding the type of knowledge, the ADDIE model approaches procedural knowledge. Furthermore, by fostering learners' positive attitudes and perceptions regarding the adoption and use of technology for educational purposes, the ADDIE model is thought to be appropriate for the design and implementation of mobile learning and is preferred for the development of virtual reality commands (Abdul Rahman et al., 2021). The model ADDIE is well-known and acknowledged as a model for creating and assessing learning experiences, courses, and educational content based on its fundamental theoretical and philosophical features (Trust and Pektas30). Pedagogical situations form the basis of this concept. The foundation of the ADDIE model is the overall system.

It was noted that a well-structured process is guaranteed to adapt to different educational contexts, whether digital or traditional, in terms of its structure and how the ADDIE model operates (Fatih, 2016). The ADDIE model's nearly inflexible structure, which is hierarchical and linear, is another characteristic. But among all design models, its simplicity, adaptability, and structural integrity make it one of the most widely used; most of its variants and spin-offs even serve as inspiration for others attempting to develop their models, because of this, it is referred to as a model for instructional systems design by even the most seasoned designers (Jusas et al., 2021). If the design team adheres to a strict workflow, it is a restriction This indicates that although the movement is flexible from one stage to the next, it is always circular. As a result, it is ineffective without thoroughly planned material and preceding analysis (Abernathy, 2019). Furthermore, it imposes limitations, particularly on instructors who may not believe that students need to adhere to rigorous guidelines to study well (Spatioti & Kazanidis, 2022). In conclusion, the ADDIE model is a well-liked and useful framework for instructional design that involves creating educational materials through an organized and iterative approach. It is set up conventionally and sequentially, meaning that you cannot go to the subsequent phases if you do not complete the current one.

Key Components and Processes of the ADDIE Model in Teaching Module

The stages of the ADDIE model may also be adjusted to the demands of the target user and can be used in tandem with other models as well. The ADDIE model encompasses five key stages Analysis, Design, Development, Implementation, and Evaluation, with each stage essential to the overall success of the instructional materials.

Analysis Phase: The Analysis stage is the first stage in the ADDIE model and is a critical component in the design of effective instructional materials. This stage involves identifying the learning needs of the target audience, including their goals, skills, knowledge, and abilities. The data collected during this stage was used to develop learning objectives and to determine the appropriate teaching strategies. The Analysis stage is vital as it ensures that the instructional materials align with the needs of the target audience (Iftitah, 2023). The initial phase involves analyzing the fundamental requirements of a certain group, identifying the educational objectives, defining the boundaries of the proposed learning environment, and assessing the knowledge and abilities of the trainees. Finding the problem and a solution is the first step in the analysis process. The goal of the analysis of the learning module's first creation phase is to make sure that the module's design can successfully address the demands of the students to solve the problem (Boyman, Jamal et al., 2020).

Design Phase: design refers to the process of determining learning objectives, creating activities, evaluating material, selecting instructional resources, and developing lesson plans. It is important to have a methodical and precise approach. It is necessary to have a premeditated plan outlined in the guidance (Spatioti & Kazanidis, 2022). The goal of the design phase is to choose and create the teaching strategies that will be applied in the creation of the learning module (M. H. M. Hashim, 2015)(S. Hashim et al., 2022). The design process also entails deciding on the forms, structures, methods of instruction, theories of learning, and media and technology applications. Boyams 2020. As a result, several factors need to be decided upon throughout the design process, including the best learning objectives, exercises, training, and assessments that must be used, as well as how the application presents its content.

Development Phase: This is the process of developing and generating instructional materials. If e-learning is involved the designers build or integrate technological resources. The learning module will be utilized throughout this phase (Iftitah, 2023). The development phase's creation of learning modules is predicated on the design outcomes put into practice in the phase before. Moreover, user manuals, lesson plans, instruction, and stimulation to spark interest should all be included in the creation of learning and teaching modules (Boyman et al., 2020). After the learning module is finished, the development phase will move on to the implementation phase. The researcher gives information about the module's development at this stage.

Implementation Phase: The result is put into the application process in practice inside the unique learning contexts for which they were intended. At this point, the continual modification of the software is a crucial procedure to ensure optimal performance and excellent outcomes. The implementation step consists of operating a genuine learning module and designing a course architecture. This is done to guarantee that the learning module is effectively implemented (Boyman et al., 2020). In addition, the implementation

phase aims to improve the module materials by evaluating the learning module. Several variables must be tested during the implementation phase, including instructor preparation, student preparation and background, and classroom environment (Boyman et al., 2020).

Evaluation Phase: It is the systematic complete analysis of an ongoing educational activity considering its usefulness. The assessment is separated into two kinds based on the period of its execution and its intended aims, the formative and the summative assessment (Spatioti & Kazanidis, 2022). Formative and summative assessments are the two forms of evaluations used to measure learning modules. The goal of formative assessment is to increase the learning module's efficacy. Summative evaluation, on the other hand, aims to examine the entire learning module that is generated. The purpose of the evaluation step is to test and assess how well the generated learning module fits the needs. The assessment phase's goal is to make sure the learning module functions properly and meets its goals (Boyman, Jamal, et al., 2020)

Examples of the ADDIE model in TVET

The ADDIE model, consisting of the Analysis, Design, Development, Implementation, and Evaluation phases, provides a systematic blueprint for creating effective learning experiences. It is renowned for its flexibility and adaptability, allowing instructional designers to tailor each phase to suit the specific needs of learners and the learning context. Technology integration within the ADDIE model allows for enhanced learner engagement, personalized learning experiences, and the fostering of critical 21st-century skills, such as digital literacy and problem-solving (Abuhassna et al., 2024). The ADDIE model provides a comprehensive review of the developing training program in various educational contexts, including TVET. Oppong-Gyebi et al (2022), explore the development of training modules for TVET teachers in the automotive sector, highlighting the challenges and best practices. Brown et al. (2018) examine the effect of the ADDIE model on TVET teacher performance, providing insights into its effectiveness. Lin & Zhang (2020), highlight best practices in designing and developing training modules for TVET teachers in the automotive sector.

Feng (2023), created curriculum and teaching strategies, for introducing technology-enhanced English subject training. With an efficiency ratio of 82.40/81.33, the assessment phase verified the efficacy of information technology (IT) using the ADDIE paradigm leading to a notable improvement in student achievement and high teacher satisfaction. Another example is Abuhassna et al. (2024) integrating technology into education, leading to improved teaching and learning outcomes. The combination of the ADDIE model and technology creates a powerful and adaptable framework that enhances educational practices, promotes innovation, and addresses various learning needs across different disciplines. This synergy offers a comprehensive approach to modern education, supporting diverse instructional goals and fostering meaningful learning experiences. However, with the rapid evolution of technology, these phases necessitate a harmonious infusion of digital tools and methodologies. This integration of technology within the ADDIE framework leads to the creation of technology-enhanced learning experiences that cater to diverse learning styles and preferences (Abuhassna et al., 2024).

Advantages and Disadvantages of the ADDIE Model in TVET

The widely used ADDIE model in TVET provides a framework for instructional design that has both advantages and disadvantages. In this section, we will discuss some of the advantages and disadvantages of the ADDIE paradigm in TVET.

Advantages

1. Comprehensive and methodical approach: The ADDIE model offers a thorough and methodical approach to creating instructional materials that work. This is especially crucial in technical and vocational education and training, where it's important to make sure the materials are developmentally appropriate and in line with the learning objectives.
2. Flexibility: Modular construction may be enlarged or have modules removed to meet the owner's changing demands or financial situation. This is a very beneficial option, particularly for young families whose needs for more room to live in as well as their financial capacity grow with time.
3. The ADDIE model, a well-known instructional design framework, serves as a beacon guiding this development and providing a planned approach to attain pedagogical excellence (Abuhassna et al., 2024). Nonetheless, the seamless amalgamation of innovative technical tools and strategies with instructional design approaches continues to be a crucial concern and a promising avenue, given the unparalleled advancement of technology (Rizal et al., 2021).
4. Flexibility and adaptability: The ADDIE model is a flexible and adaptable framework that can be tailored to meet the specific needs of TVET (Reiser & Dempsey, 2018). The model can be modified to fit different educational contexts and can be adjusted based on feedback from learners and educators.
5. Evaluation is emphasized: The ADDIE paradigm emphasizes evaluation, which is crucial in TVET as educational materials' efficacy must be regularly evaluated and enhanced. Future educational materials may be designed with input from educators and learners related to the ADDIE model's assessment phase (Iftitah, 2023)

Disadvantages

1. ADDIE lacks basic elements that correspond to the specifics of e-learning projects (Almelhi, 2021)
2. Time-consuming: Using the ADDIE paradigm might take some time, especially in the first phases of analysis and design. This can be difficult in Technical and vocational education and Training as it's frequently necessary to create lesson plans quickly and effectively (Almelhi, 2021).
3. Lack of adaptability: After the design process is over, the ADDIE model may be rigid and difficult to modify quickly or simply, and this might be a drawback in TVET where it's important to be flexible to adjust to the evolving requirements of both teachers and students. (Iftitah, 2023).
4. An excessive focus on design: The ADDIE approach occasionally places an excessive amount of attention on the design stage at the expense of other crucial phases, such as investigation and assessment. Therefore, educational technology resources may be well-designed yet may not adequately address the requirements of young learners (Selfi Iftitah, 2023).

Ultimately, educators and instructional designers should carefully weigh the benefits and drawbacks of the ADDIE approach in TVET. Even if the model offers a methodical and thorough approach to instructional design, it might not always be the most appropriate choice for the requirements of educational technology. It's crucial to employ the ADDIE model as a flexible framework that may be tailored to the unique requirements of TVET.

The Teaching Module and Definitions

A module is a set of instructional materials connected to a specific subject's idea unit. (Eliana et al., 2014). A module is described as a small section that is comprehensive, different from other small parts, and meaningfully connected to other small parts found that the term "module" in education refers to a tutorial chapter that is associated with a particular topic. Furthermore, a module is a teaching and learning unit that systematically and gradually covers a specific subject to make it easier for the target audience to learn on their own (Abdul Rahman et al., 2021). A module refers to an instructional package associated with a specific subject's concept unit. Its objective is to provide personalized instruction, allowing a student to proficiently grasp the content of one subject unit before progressing to the next. The modules aim to equip educators with the necessary resources to create dynamic, student-focused learning spaces in their classrooms (Rahman et al., 2021). Although a lot of teachers are drawn to this student-centred approach to teaching, they have found that it requires a significant amount of time to develop activities that complement one another, tell a cohesive story, and cover the required teaching materials.

The Benefits of Using Modules in Teaching and Learning

Modules are an alternative tutorial technique for the learners' education and satisfaction. The teacher's job is to direct and oversee the student's progress as they complete their tasks independently; the students work independently. Utilising the modules, students engage in a variety of engaging tasks that are tough enough to maintain concentration and attention. (Syam & Ermawati, 2024). The use of modules expands independent study as well. It instructs students to observe or apply knowledge. A realisation exercise is provided after a series of simple to sophisticated exercises. The way the activity is set up inherently formalizes how much work the students will have to do. Engaging in the study of information presented in modules fosters the development of considerably enhanced self-study or learning skills in students. Another advantage is the increased sense of responsibility as students progress through the tasks outlined in the module, facilitating independent growth. This process occurs without direct guidance or assistance from the teacher, as highlighted by (Syam, 2019).

Overview of Needham's 5 Phases Module

Constructivism is a teaching strategy that promotes comprehension and critical thinking and was introduced by the Curriculum Development Centre in 2001 as a module to help educators implement this method effectively. The Ministry of Education places a higher value on constructivism theory, especially issues involving science, math, and technology. Constructivism emphasises how students actively create their knowledge, which means that teachers have a more important role than simply imparting knowledge. Instead, they must assist students in making sense of new information by assisting them in interpreting it in the context of their prior knowledge. Table 1 below is Needham's five phases of constructivism.

Table 1

Needham's Five Phases Constructivism Model

Phase	Aim	Example of Exercise
Orientation	Students are motivated when they are drawn in and shown interest in.	Conditions-based demonstrations pose an interesting problem.
Eliciting of Ideas	Determine the knowledge that a student has before the	Concept Map Q&A session.
Restructuring of Idea	Enhance or disguise existing knowledge by contrasting it with scientific concepts and evaluating it using scientific techniques.	Science process skills and theory are combined in this activity. Engage in group communication and learn new skills and technologies with the help of relevant educational resources.

Table 2.1

Continued

Phase	Aim	Example of Exercise
Application of Ideas	Apply concepts to novel circumstances.	Address fresh issues Develop or manage initiatives
Reflection	Watch out for shifts in your past knowledge	Considering the Questions, assisting pupils in assessing their ideas, concepts, and progress in processing abilities.

Key Components and Processes of the Needham 5 Phases of Constructivism Model

Orientation

This stage aims to capture students' interest and attention to inspire them to remain motivated in the ongoing learning process. Teachers must create a learning environment that can inspire students to learn at this point. (Zahari et al., 2021). Students are given the choice to investigate material and take charge of their learning process to foster discovery. (Humairah & Sitorus, 2020).

Generation of Ideas

The phase aims to help students recognize their existing knowledge through appropriate learning activities. These activities help students retrieve memories related to new information. The goal is to identify students' prior knowledge through engaging exercises that encourage students to recall memories related to new information. This helps students understand and apply their existing knowledge effectively (Lee & Zainal, 2017)

Restructuring

The phase aims to enhance students' existing knowledge and ideas through analytical or scientific thought, allowing them to replace alternative notions with scientific ideas. New concepts are taught in various ways, assisting in the formation of concepts. Students will be

able to define words, explain ideas, and ask questions about the new subject, providing explanation, justification, and clarification.

Application of Concept

This stage aims to find student ideas that have been updated or integrated and can be used in fresh circumstances. In other disciplines or the actual world, the concept has been expanded and built upon. Through problem-solving in novel contexts, students will apply new knowledge. This is done to foster fresh understanding and curiosity in the students (Bano et al., 2022).

Reflection

This stage is to gauge how well pupils comprehend and evaluate the original concepts. Students can master information and abilities by applying the earlier concepts in the new learning environment with the support of self-assessment or a motivating reward. Additionally, this stage gives students the chance to assess how their ideas and skill sets have changed. Students juxtapose their prior knowledge with new information and consider how learning has altered their opinions. To gauge how far their original notion has evolved, students can also reflect. Students' personal posts, group conversations, and self-writing exercises can all be used by teachers to gauge their level of comprehension (Zahari et al., 2021).

Advantages and Disadvantages of the Needham 5 Phases of Constructivism Model

Surif et al., (2014a) Highlight some advantages and Disadvantages of Needham's 5 phases of the constructivism model.

1. **Learner-Centered Approach:** This approach places a strong emphasis on active learning by allowing students to produce, reorganize, and apply their ideas to enhance their comprehension.
2. **Promotes Critical Thinking:** Needham's paradigm encourages critical thinking and knowledge production by emphasizing idea development, restructuring, and reflection.
3. **Promotes Active Engagement:** Students take a more active role in their education, shifting from being passive recipients of knowledge to active contributors.
4. **Encourages Reflection:** Needham's model's reflection phase invites students to assess their knowledge and development, which can reinforce learning.
5. **Constructivist Foundation:** This is consistent with the ideas of constructivism, which holds that knowledge is created by students rather than acquired passively.

Disadvantage of the Needham 5 Phases of Constructivism Model

1. **Less Structured:** Needham's model may appear less structured than ADDIE, which could confuse when implementing it.
2. **Time and Effort Intensive:** Both teachers and students must invest more time and energy to achieve active learning and deep involvement.
3. **Less Emphasis on Objectives:** Although the Needham model encourages inquiry and knowledge creation, it could not place as much emphasis on specific goals as ADDIE, which is less focused on learning results.
4. **Difficult for Large Groups:** Because the constructivist character of the approach necessitates attentive facilitation and tailored attention to each student's ideas and thoughts, it may be challenging to handle in larger groups.

Comparison of Addie and Needham's 5 Phases of the Constructivism Model

Instead of using more traditional teaching techniques, Needham's Five Phases model employs a constructivist teaching methodology. It is made up of orientation, idea generation, idea restructuring, idea application, and idea reflection. Analysis, Design, Development, Implementation, and Evaluation are all mentioned in the ADDIE model. ADDIE follows a standard order of operation; this methodical approach was deemed reasonable, thoughtful, and thorough (Allen, 2012). One incredibly effective theory of teaching and learning is Needham's Five Phases Constructivism Model (Surif et al., 2014b). They actively assist students in deepening their understanding as they are taught and learning (M. H. M. Hashim & Kasbolah, 2012). The teaching and learning model known as the implementation stage is delivered by the ADDIE model, which is carried out successfully and efficiently in the classroom, lab, or online (Boyman, Jama, et al., 2020). While Needham's model stresses constructivist principles and emphasizes active learning and knowledge construction by learners (Surif et al., 2014a), the ADDIE model is a systematic instructional design process that focuses on the development of instructional materials (Muhammad & Kabir, 2016)

The similarities of the ADDIE and Needham 5 phases models in TVET are that both models have several phases, but each phase has a different focus and set of activities. Needham's model places more emphasis on engaging, exploring, explaining, elaborating, application of ideas and reflection than ADDIE, which is focused on analysis, design, development, implementation, and evaluation. ADDIE concentrates on the methodical creation of educational resources, guaranteeing that they fulfil predetermined goals (Alwi et al., 2019), whereas Needham's approach concentrates on providing learners with meaningful learning experiences, enabling them to build their awareness. In conclusion, while both models seek to enhance learning outcomes, their methods and points of emphasis are different. Needham's model places more emphasis on supporting learners' active learning and knowledge construction than the ADDIE model, which is more focused on the methodical creation of instructional materials.

Criticism of the ADDIE model in TVET/ Criticism of the Needham in TVET

One popular instructional design approach that has been applied in a variety of educational settings, including technical and vocational education and training, is the ADDIE model. But there have also been objections to the ADDIE concept in TVET. The ADDIE paradigm has been criticized for being very inflexible, linear, and rigid. According to critics, the linear approach of the ADDIE model can be overly restrictive and prescriptive, making it challenging to adjust to the evolving requirements of young learners (Halder & Saha, 2023). A further critique levelled at the ADDIE approach is its excessive concentration on the creation and arrangement of educational resources, with little attention paid to the requirements and attributes of the students. According to critics, the learner may become disengaged and unmotivated because of this emphasis on the resources rather than them (Iftitah, 2023). The ADDIE paradigm has also been criticized for requiring excessive amounts of time and resources. The lengthy review and modification process is criticized for being expensive and ineffective, especially in the context of TVET where resources and time may be few. (Halder & Saha, 2023). Lastly, even though the ADDIE model may be a useful instructional design framework, it has received criticism in the field of technology education for being restrictive, prioritizing resources above students, and taking a lot of time. TVET instructional designers

must take this critique into account and work to modify the model to better suit TVET learners' requirements.

Ways in which each Model could be Improved for Teaching and Learning in TVET

The hybrid approach combines Needham's 5 Phases with ADDIE, focusing on active learning and content creation. It is best applied in exploratory and critical thinking contexts, like problem-solving, and vocational training. The model's reflection phase can be combined with ADDIE's evaluation emphasis for continuous development. TVET adaptation can enhance skills-based learning by adding in-person practical activities and a planned development process. In conclusion, the ADDIE and Needham 5 phases models have been criticized for their limitations in technical and vocational education and training. To address these limitations, both models could be improved by providing more flexibility, integration of the evaluation process, more guidance on designing developmentally appropriate materials, and more opportunities for collaboration and feedback. By making these improvements, instructional designers can develop more effective instructional materials that meet the diverse needs of learners in technical and vocational education training.

Current Trends in Addie and TVET

Muhamad and Nazeri, (2019), create a Vocational Learning (Voc-Learning) e-learning prototype for Malaysian vocational education in Malaysia. Using the ADDIE model. It was discovered that the Malaysian system of vocational education still lacks a thorough investigation of e-learning strategies. However, the unique requirements of the Malaysian vocational education system may have an impact on the developed prototype's efficacy. M. H. M. Hashim and Kasbolah, (2012), found out how the Needham Five Phase Constructivism Model is applied in Civil, Electrical, and Mechanical Engineering Studies at Technical Secondary Schools the goal of this study is to enhance the quality of instruction and learning in the classroom, it is advised that teachers be exposed to a range of teaching models. The instructional website "Ionic Bond" was created by (Surif et al., 2014b), using the ADDIE model and Needham's Five Phases Constructivism Model. According to the study, students in the pure science stream felt that the educational website "Ionic Bond," which was created using the ADDIE model and Needham's Five Phases Constructivism Model, was appropriate for addressing alternative frameworks for the ionic bond concept.

Furthermore, the study did not investigate how the website might be a useful tool for improving chemistry instruction and encouraging a deeper comprehension of scientific ideas. Zahari et al (2021), demonstrate the efficacy of ADDIE-integrated flipped learning, enhancing instruction quality. The study emphasizes the potential future research areas and the implications of online learning in terms of instruction. Shahat (2023), developed a training program based on the ADDIE model to assist graduate students in art education in acquiring creative skills relevant to Indonesian raw material synthesis. According to the study's findings, creativity and ADDIE module training are strongly correlated, allowing students to go back to earlier phases when they notice a difference between what they believe to be true and what they see.

Recommendation

Future research should focus on testing these models in actual situations across multiple TVET fields to gain empirical evidence of their usefulness. The article might also study how

these models can be updated to include future technology such as artificial intelligence and virtual learning environments to better instructional design. Furthermore, a hybrid approach integrating components of both the ADDIE and Needham models might be examined to build a more holistic instructional design framework that maximizes student engagement and learning results.

Conclusion

Both the ADDIE and Needham's Five Phases models are excellent foundations for instructional design in TVET. The systematic and iterative method of ADDIE offers a robust framework for developing instructional modules that can be readily customized for different learning settings. Contrarily, Needham's Five Phases advocates for a student-centred and constructivist method, which improves the learner's capacity to actively participate in and contemplate the subject. Integrating structured design with active learning concepts has the potential to provide even more significant outcomes. This study highlights the significance of choosing suitable instructional models that align with the learning objectives, material characteristics, and learners' requirements.

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