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Adopting an eLearning Model Based on Rogers' Process for Diffusion of Innovations

Hilmi Raouf Hamdan[1,*] **& Miloud Ammar**[2]

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Abstract: Background: Integrating technology in education requires innovative models that promote active learning and digital competencies. The Proposed model addresses this, based on Constructivism, Connectivism, ADDIE, Microlearning, and Flipped Learning**. Purpose:** This study aimed to adopt and validate the Proposed model as an innovative eLearning model using Rogers' Diffusion of Innovations, assessing its applicability and effectiveness in education. **Methodology:** A mixed-methods design was used with 122 teachers, 4 experts, and 6 supervisors. Internal validation involved expert reviews and supervisor interviews, while external validation relied on a teacher adoption questionnaire. **Key Findings:** Results showed high adoption and acceptance of the Proposed model, confirming its relative advantage, simplicity, compatibility, trialability, and observability. Expert and supervisor feedback led to an enhanced edition. **Key Recommendations:** The study recommends disseminating the Proposed model, adopting it in teacher professional development, and recognizing it as a comprehensive eLearning instructional design model.

Keywords: Instructional Design, Theory of Diffusion of Innovation (DOI), Constructivism, Connectivism, HAMDAN model, and eLearning.

تبني نموذج تعليم الكتروني استنادا على عملية روجرز لنشر الابتكارات

حلمي رؤوف حمدان[1،*]**، وعمار ميلود**[2]

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الملخص: الخلفية: التوسع السريع في استخدام التكنولوجيا في التعليم استلزم تطوير نماذج مبتكرة تدعم التعلم النشط وتعزز كفاءات المعلمين الرقمية. بناءً عليه، تم تطوير نموذج مقترح يعتمد على البنائية، الترابطية، نموذجADDIE ، التعلم المصغر، والتعلم المعكوس. **الهدف:** هدفت الدراسة إلى تبني نموذج مقترح في التعلم الإلكتروني كنموذج مبتكر وجديد، استنادًا إلى نظرية نشر الابتكارات لروجرز، والتحقق من فاعليته وصلاحيته للاستخدام في البيئات التعليمية المختلفة. **المنهجية:** اتبعت الدراسة منهجية مختلطة شملت 122 معلمًا، و4 خبراء، و6 مشرفين. تم التحقق من صحة النموذج داخليًا بتقييم الخبراء والمشرفين، وخارجيًا من خلال استبانة المعلمين بعد التدريب على النموذج. **النتائج الرئيسية:** أظهرت النتائج اعتمادًا عاليًا للنموذج من قبل المعلمين والخبراء والمشرفين، مؤكدة وضوح ميزاته، بساطته، توافقه، قابليته للتجربة، وسهولة ملاحظة نتائجه، وأسفر تقييم الخبراء عن تطوير نسخة أكثر تكاملًا. **التوصيات الرئيسية:** أوصت الدراسة بضرورة نشر النموذج المقترح على نطاق واسع، واعتماده في برامج التدريب المهني للمعلمين، واستخدامه كنموذج تصميم تعليمي معتمد في بيئات التعلم الإلكتروني.

الكلمات المفتاحية: التصميم التعليمي، نظرية نشر الابتكار، البنائية، الترابطية، نموذج حمدان، التعليم الإلكتروني.

1 PhD student at faculty Social and Human Sciences, ABDELHAMID IBN BADIS UNIVERSITY OF MOSTAGANEM,
Researcher at Laboratory for the Analysis of Quantitative and Qualitative Data on Psychology and Social Behavior / Algeria.
* Corresponding author email: helmi.raoufhelmihamdan.etu@univ-mosta.dz, Orcid: https://orcid.org/0000-0001-5121-8649
2 Head of the education section at faculty Social and Human Sciences, ABDELHAMID IBN BADIS UNIVERSITY OF MOSTAGANEM, manager of Laboratory for the Analysis of Quantitative and Qualitative Data on Psychology and Social Behavior, Algeria. miloud.ammar@univ-mosta.dz, Orcid: https://orcid.org/0000-0002-0004-2927

1 طالب دكتوراة، قسم علوم التربية، كلية العلوم الاجتماعية، جامعة عبد الحميد بن باديس-مستغانم، الجزائر، باحث في مخبر تحليل المعطيات الكمية والكيفية للسلوكات النفسية والاجتماعية.
* الباحث المراسل: helmi.raoufhelmihamdan.etu@univ-mosta.dz
Orcid: https://orcid.org/0000-0001-5121-8649
2 قسم علوم التربية، كلية العلوم الاجتماعية، جامعة عبد الحميد بن باديس-مستغانم، الجزائر، مخبر تحليل المعطيات الكمية والكيفية للسلوكات النفسية والاجتماعية. miloud.ammar@univ-mosta.dz.
Orcid: https://orcid.org/0000-0002-0004-2927/

Introduction

Although technology is widespread in education, teachers must use it actively with suitable pedagogy to engage students in learning and problem-solving (Ozden et al., 2024). As its impact grows, teachers' roles are shifting to become facilitators, designers, and innovators (Liu et al., 2024). Technology ultimately enables inclusive learning and innovation (Boateng et al., 2024).

The COVID-19 pandemic highlighted the urgent need for technology in education, as schools shifted to online learning (Chen et al., 2024; Hamdan, 2020; Li et al., 2023; Barham et al., 2023; Khalaily, 2023). Achieving high-quality online education requires strong student engagement and interactivity, supported by reliable infrastructure, internet access, device availability, and well-trained teachers in technology use (Hamdan & Miloud, 2024; Li et al., 2023; Roman & Plopeanu, 2021).

One of the most important criteria indicating the success of learning is the way teachers integrate technology in education (Fütterer et al., 2023). This leads to the importance of building teachers' skills (digital literacy, educational technology integration, instructional design and content creation, online feedback tools, online collaborative tool use, classroom technology management, etc.) and competencies in using technology in education to enable them to help students in their learning (Hamdan, 2020; Liang & Law, 2023).

Building teachers' digital skills is essential for improving learning outcomes and student engagement (Rezai et al., 2024; Roman & Plopeanu, 2021; Zhao, 2024). However, there is a lack of professional development programs and clear instructional design to enhance these competencies (Hamdan, 2020; Rezai et al., 2024). Due to these gaps and weaknesses in teachers' digital skills (Dai, 2023; Tomczyk, 2024), ongoing support is necessary to boost their active role in education (Alieto et al., 2024).

Addressing this, Hilmi Hamdan proposed and developed the Model in eLearning, which emphasizes self-learning, discussion, knowledge building, and problem-solving as learner-centered strategies (Ghosheh et al., 2022; Hamdan, 2020).

The Proposed Model in eLearning is an innovation that applies ideas in new ways or integrates strategies (Ghosheh Wahbeh et al., 2023; Taylor et al., 2018). To adopt it, teachers must first receive sufficient information about the model (Ghosheh Wahbeh et al., 2023). A key framework for adoption is Rogers' Diffusion of Innovations (DOI) theory, which explains why some innovations succeed while others fail (Rogers, 2003; Ghosheh Wahbeh et al., 2023; Tanye, 2016; Taylor et al., 2018).

Rogers' process for adopting innovations requires that innovations be introduced before implementation and approval. Experimenting with the model provides an opportunity for teachers and learners to offer feedback, which yields valuable data for its improvement. Without this, all efforts may be ineffective (Ghosheh Wahbeh et al., 2023).

To increase the spread and adoption of the model, a structured plan is needed to evaluate its effectiveness and guide its development. This includes presenting it to experts, gathering learners' feedback, and involving them early in the design. Such steps justify innovation, ensure support through discussion and training, and expand its use by engaging decision-makers and identifying resources for large-scale implementation (Ghosheh Wahbeh et al., 2023; Taylor et al., 2018).

This study presents details about the construction and validation of the Proposed Model in eLearning and aims to adopt it based

on Rogers' theory. Therefore, the study will address the following questions:

1. How did experts' and supervisors' evaluations inform the modification and development of the Proposed Model?
2. To what extent has the Proposed Model been adopted by experts and supervisors based on Rogers' process for the diffusion of innovations?
3. To what extent has the Proposed Model been adopted by teachers based on Rogers' process for the diffusion of innovations?

To answer the third question, the following null hypotheses will be tested:

- There are no significant differences at $\alpha \leq 0.05$ in the mean responses of participants on the questionnaire for adopting the Proposed Model attributed to teachers' gender.
- There are no significant differences at $\alpha \leq 0.05$ in the mean responses of participants on the questionnaire for adopting the Proposed Model attributed to teachers' years of experience.
- There are no significant differences at $\alpha \leq 0.05$ in the mean responses of participants on the questionnaire for adopting the Proposed Model attributed to teachers' state.

Literature Review

Rogers' Process for Diffusion of Innovations (DOI): To verify the external validation of the Proposed model, it is essential to implement and evaluate the model systematically. A structured process is also required to introduce it effectively. Therefore, the researcher adopted Rogers' process for the diffusion of innovation, as the Proposed model qualifies as an innovation according to Rogers' definition, which considers any new idea, procedure, tool, process, strategy, or model an innovation (Dibra, 2015; Ghosheh Wahbeh et al., 2023; Rogers, 2003).

Rogers' process involves several key steps: providing users with sufficient information about the innovation, helping them form opinions about it, guiding them to decide whether to adopt or reject it, and finally implementing it to validate their decision (Dibra, 2015; Rogers, 2003). The process consists of five stages (Dibra, 2015; Eichler & McDonald, 2021; Ghosheh Wahbeh et al., 2023; Rogers, 2003) as follows:

- **Knowledge**: In this stage, the model must be described clearly so that adopters understand why they should use it.
- **Persuasion**: This stage involves forming a favorable or unfavorable attitude toward the model. It may require providing additional information and clarification to help adopters explain and understand the model. This step is closely linked to the knowledge stage, as it builds on the model's foundational principles.
- **Decision**: At this stage, adopters decide to accept or reject the model, often based on testing its ability to address their challenges. Rejection can be active (after initial use) or passive (without trying). Adequate opportunities to test the model are crucial before the final decision.
- **Use**: In this stage, the model is applied in educational and professional development activities. Instructional designers provide training and guidance, remaining flexible to modifications suggested by adopters during implementation.
- **Confirmation**: This final stage involves adopters evaluating the model, assessing satisfaction, learner performance, ease of use, and overall effectiveness. If expectations are unmet, designers may discontinue it, while supporting adopters through ongoing training and addressing implementation challenges.

- **Design Features Leading to Successful Implementation**
- In addition to the steps in Rogers' process for the diffusion of innovation models, he identifies several other crucial factors that influence the adoption rate. These factors, known as the five characteristics of innovative models (Dibra, 2015; Eichler & McDonald, 2021; Ghosheh Wahbeh et al., 2023; Rogers, 2003), include:
- **Relative Advantage:** This refers to how the new model is seen as an improvement in current practice. The more unique benefits it offers, the more likely it is to be adopted. Instructional designers should clearly highlight its added value.
- **Compatibility:** This refers to how well the innovation aligns with adopters' values, needs, and context. Greater compatibility increases adoption, while misalignment can cause resistance. Instructional designers should show how the model fits the target context.
- **Complexity:** Refers to how difficult innovation is to understand and use. Excessive complexity can hinder adoption, so designers should reduce it through prototype testing and usability checks.
- **Trialability:** The extent to which the innovation can be tested on a small scale. Phased trials and feedback encourage adoption and lower costs.
- **Observability:** Concerns the visibility of results. Clear, measurable outcomes and feedback help showcase impact, though Rogers viewed this as the least influential factor.
- Additionally, Ghosheh Wahbeh and Tanye (Ghosheh Wahbeh et al., 2023; Tanye, 2016) identified further influential factors within Rogers' theory of innovation adoption:
- **Time**: The timing of adoption plays a role in success—early adoption often correlates with a higher rate of eventual acceptance.
- **Social System**: The structure of decision-making within an organization or group—whether top-down, bottom-up, or hybrid—can significantly impact adoption. Successful implementation often depends on a balanced approach that considers all levels of input.
- **Communication**: Effective communication is essential during the knowledge and persuasion stages. Clear, consistent, and targeted messaging significantly enhances the adoption rate of an innovation.

Instructional Design Models: E-training design should be interactive, enjoyable, and easy to use. It involves developing online programs that connect learning and training (Östlund, 2017). Learning often refers to pedagogy for young learners, while training relates to andragogy for adults. Both aim to educate stakeholders, whether young or adult (Jeanes, 2021; Mackintosh-Franklin, 2016; Noor et al., 2012).

Training design models rely on instructional design (ID) models that consider learners' characteristics, prior experience, and goals, which shape the educational method (Sălăvăstru, 2014). ID requires a systematic plan for teaching and training to guide learning, making teacher training and skill development essential (Seechaliao & Yurayat, 2021; Blömeke et al., 2022).

A key model is ADDIE—Analysis, Design, Development, Implementation, and Evaluation—developed in the 1970s at Florida State University. Widely applied in e-content design, it supports effective planning and has proven successful in developing programs that promote community learning, self-learning, and both live and offline training (Nadiyah & Faaizah, 2015; Yu et al., 2021).

The ADDIE model consists of five phases:

- **Analysis:** Identifies trainees' needs and learning theories (Nadiyah & Faaizah, 2015). This study focused on equipping teachers for online learning, drawing on constructivism, flipped, virtual flipped, and microlearning principles.
- **Design:** Defines learning outcomes, materials, assessments, and methods (Ganesan & Muruganantham, 2015). Here, self-learning and learner-centered approaches were used.
- **Development:** Creates activities, tools, multimedia, and interactive components (Nadiyah & Faaizah, 2015; Ozdilek & Robeck, 2009; Yu et al., 2021). This study used videos, texts, websites, and synchronous/asynchronous platforms.
- **Implementation:** Applies for the designed training activities.
- **Evaluation:** A continuous process across all phases, with each step reviewed and refined if needed (Nadiyah & Faaizah, 2015; Ozdilek & Robeck, 2009; Yu et al., 2021).

Figure 1 shows the ADDIE steps.

Figure (1): ADDIE model (Nadiyah & Faaizah, 2015).

Constructivist Theory: Constructivism views learners as active participants who build knowledge through tasks, performance, and projects, becoming explorers and problem-solvers. Research confirms its positive outcomes (Bönke et al., 2024; Lu et al., 2024; Sung et al., 2023). In the Proposed model, learners are required to search, discover, and solve tasks independently.

Connectivism Learning Theory: Connectivism, introduced by Siemens (2004, 2005), sees learning as a social process occurring through interaction and collaboration. Digital environments and tools support these connections, enabling learners to build knowledge together (Corbett & Spinello, 2020; Sitti et al., 2013; Thoma et al., 2023). In the Proposed model, connectivism underpins learning as participants discuss and solve tasks using asynchronous platforms.

Micro Learning/Training: Microlearning divides content into small, sequential objectives, allowing learners to engage in short sessions—especially useful in emergencies or limited attention contexts. Closely linked to micro training, it suits e-training (Díaz Redondo et al., 2021). In the Proposed model, learners used short, single-objective videos to sustain learning during the COVID-19 pandemic in Palestine, enhancing engagement (Guo et al., 2014)

Flipped Learning: Flipped learning is an educational strategy that boosts participation, interaction, critical thinking, and self-learning. Learners study content at home via videos, handouts, or articles and then engage in discussions and activities in class (Kawinkoonlasate, 2019). The flipped virtual classroom follows the same principle but uses a synchronous online platform instead of a physical classroom (Ismail & Abdulla, 2019). Both approaches underpin the Proposed model.

The Proposed Model in eLearning: There is a lack of training programs and clear instructional design to enhance teachers' digital

competencies, with many teachers showing weak skills in this area. To address this—especially during the COVID-19 pandemic—the Proposed model was designed around four principles: the ADDIE model, flipped and virtual flipped learning, microlearning/training, and constructivist pedagogy (Figure 2).

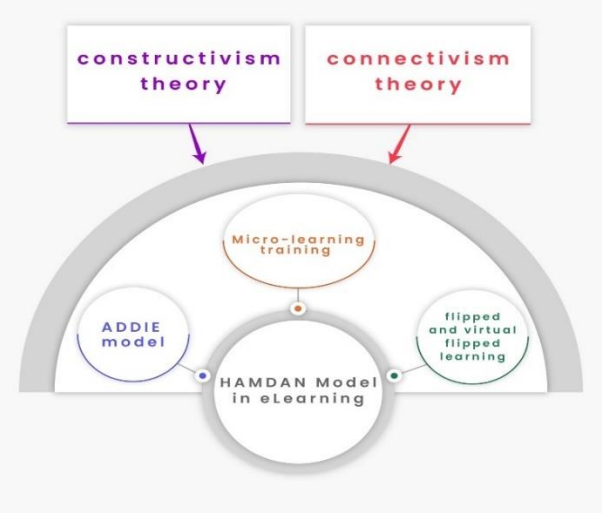

Figure (2): The HAMDAN's model Principles.

Figure 2 shows the model is based on constructivism and connectivism, alongside microlearning/training, flipped and virtual flipped learning, and the ADDIE model. Learners first construct knowledge independently, then discuss it with peers and the teacher. Small goals, microlearning, and collaborative connections support learning communities. Learners complete tasks asynchronously, receive peer feedback, submit final solutions, and then receive general feedback during synchronous sessions. All principles are guided by the ADDIE model.

he Proposed model applies the ADDIE model to both learning and training. In learning, analysis identifies content and small goals (microlearning), design sets tasks for each goal, and development creates the activities. Tasks are implemented as students discuss, solve, and submit them collaboratively. The teacher then evaluates outcomes by providing feedback in a synchronous meeting. Formative assessment occurs at each step, culminating in overall evaluation of learning outcomes.

In training, analysis identifies trainees' needs, while design defines skills, competencies, and small goals (micro-training). Development creates tasks, short videos and texts, evaluation tools, and methods such as virtual flipped and self-learning. During implementation, trainees solve tasks asynchronously and submit solutions. The trainer then evaluates outcomes and provides feedback in a synchronous meeting.

The Proposed model was first developed in 2020 during the COVID-19 pandemic in Palestine to help teachers enhance digital skills for online teaching. Drawing on over 10 years of experience and a literature review, the researcher designed the model (Hamdan, 2020; Hamdan & Miloud, 2024). It was applied in professional development programs, with feedback from trainees, trainers, and experts used to validate and refine it.

The Proposed model consists of eight sequential steps as follows:

1. Adding trainees to an asynchronous platform.
2. Assigning trainees a micro task based on the microlearning concept, attaching a short video or text with the task.
3. For clarifications or questions, learners can search the internet or ask other learners and share experiences.
4. Submitting the final task solution asynchronously.
5. The trainer/teacher gives individual or group feedback on the solutions.
6. Holding a synchronous meeting where the trainer/teacher provides final feedback and shares solutions.
7. Repeating from step 2.

Figure 3 shows the steps of the Proposed model in eLearning in its first version (2020).

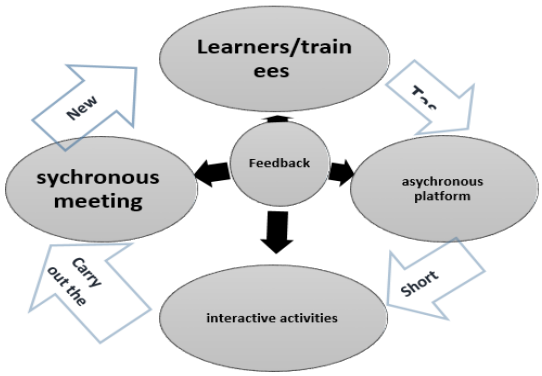

Figure (3): Sequence steps of the Proposed model in eLearning, first version 2020.

Validation of the Proposed Model in eLearning: Validation of instructional design models can be internal or external (Ghosheh Wahbeh et al., 2023). Internal validation, or formative evaluation, verifies the model's components through expert review, usability documentation, and interviews with trained supervisors (Richey, 2006; Filck, 2009). External validation assesses the impact of outcomes via field testing during model application (Araújo et al., 2024; Ghosheh Wahbeh et al., 2023; Yampinij & Chaijaroen, 2012), was validated by following the processes shown in Figure 4.

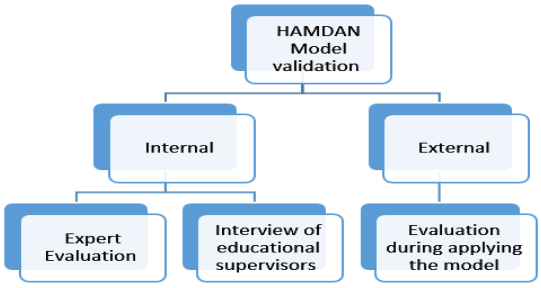

Figure (4): The processes of validation for Proposed model.

Expert evaluation involved educational experts from Palestine and the USA reviewing the model's components and processes. Six trained educational supervisors were also interviewed to provide feedback and suggest improvements. External validation included teachers attending an eLearning training course and completing a questionnaire on adopting the model.2. Method

In this study, the researcher used both quantitative and qualitative methodologies to produce clear and understandable findings (McDermott, 2023; Ruisánchez et al., 2022).

Study Design

The design involved collecting quantitative data through a questionnaire and qualitative data from interviews with experts and supervisors. The means and standard deviations were calculated for the questionnaire responses, while the qualitative data were analyzed. Both data types were then integrated.

The Sample

The study included 122 teachers, 6 educational supervisors, and 4 educational experts from Palestine, Tunisia, Sudan, Jordan, UAE, Egypt, Lebanon, Saudi Arabia, Syria, Algeria, Iraq, Kuwait, the USA, and Morocco. The teachers completed a questionnaire after training on the Proposed model (external validation, Table 1). The 4 experts work in teacher training (Table 2), and the 6 supervisors were trained on the model (Table 3).

Table (1): The Sample who answered the questionnaire.

		Frequency	Percent
Gender	Male	39	32.0
	Female	83	68.0
	Total	***122***	***100.0***
Work Experience	Less than 5	29	23.8
	5- less than 10	33	27.0
	10-less than 15	10	8.2
	15-less than 20	22	18.0
	20 -less than 25	11	9.0
	25 and more	17	13.9
	Total	***122***	***100.0***
State	Palestine	28	23.0
	Other states (Tunisia 8, Sudan 7 , Jordan 13, UAE 10, Egypt 12, Lebanon 6, Saudi Arabia 6, Syria 6, Algeria 10, Iraq 5, Kuwait 6, and Morocco 5)	94	77.0
	Total	***122***	***100.***

Table (2): the educational experts.

The expert Name	Professional experience	Years of experience
John Bergman	Educational specialist from USA, he is a pioneer flip learning	39
Dua Ghosheh/Wahbeh	PhD in learning and teaching, instructional designer and educational trainer Palestine	24
Eman Al-Najjar	PhD in learning and teaching, instructional designer, educational trainer, and monitoring and evaluation expert Palestine	20
Sharon Sawan	Mater degree Program Manager at Harvard Graduate School of Education, Middle East Professional Learning Initiative	More than 5 years

Table (3): the educational supervisors who participated in the interview.

The Supervisor's Name	Specialization	Education Degree	Years of experience
Fattoum Amara	English language	Master	21
Shukri Qatt	Islamic education	Master	12
Muhannad Salman	Mathematics	Master	23
Ruqayyah Abu Al-Rub	English language	Master	25
Attia Ismail	English language	Master	19
Mohamed Amin	Arabic Language	Master	28

Study Tools

In this study, the researcher used the following tools:

For external validation

– A questionnaire to evaluate the model by teachers. The questionnaire used was the same as the one used for adopting the GHOSHEH model, based on Rogers' attributes for successful models (Ghosheh Wahbeh et al., 2023).

For internal validation

– A descriptive interview with educational supervisors who had been trained to use the Proposed model (Richey,2006; Filck, 2009).

– A descriptive expert panel with educational experts. This included presenting the model and its steps, explaining the principles it is based on, and finally asking the experts a descriptive question about the model.

Validity and Reliability

Four experts holding PhDs with extensive experience in education reviewed the questionnaire to assess content validity. They confirmed its suitability for the study. The reliability of the questionnaire was also measured using the Cronbach's Alpha scale in the SPSS program. The overall Cronbach's Alpha was 0.94, indicating very high reliability: 0.87 for relative advantage items, 0.70 for compatibility items, 0.87 for complexity items, 0.86 for trialability items, and 0.67 for observability items, as shown in Table 4.

Table (4): Reliability Statistics.

Domain	Cronbach's Alpha	N of Items
Relative Advantage	0.87	6
Compatibility	0.70	6
Complexity	0.87	6
Trialability	0.86	6
Observability	0.67	6
Total Items	**0.94**	**30**

Procedures

To adopt the model using Rogers's process, experts first reviewed its internal validity through a panel. External validity was then assessed by applying the model in a training course, with teachers completing a validated questionnaire and educational supervisors providing in-depth interview feedback. The collected data were analyzed to derive the results.2.6 Limitation of the Study

The study was implemented during the period from August 2023 to December 2024. The sample included educational supervisors, local and international experts, and local and international teachers.

Data Analysis

Descriptive data were collected from 4 experts and 6 educational supervisors via

panels and interviews after training on the model. Quantitative data came from 122 teachers across 14 countries who completed a post-training questionnaire following a course using the Proposed model.

To answer the first question: How did experts' and supervisors' evaluations inform the modification and development of the Proposed Model?

Thematic analysis was used to identify patterns and generate insights by examining and comparing data (Levitt et al., 2018). The process involved reading and re-reading notes to become familiar with the content, confirming and finalizing initial coding, and reviewing extracted themes to ensure quality.

Feedback from experts included

John Bergman suggested that learners should not be directed to use the Internet when solving tasks to prevent misuse, particularly of artificial intelligence. Instead, he recommended providing more than one short explanatory video about the task, Doaa Ghosheh/Wahbeh and Mohammad Amin emphasized that the model should include a clearer evaluation process, analysis of learner characteristics, and breaking down the content into small goals, Muhannad Salman suggested adding an arrow between learners in the asynchronous part of the model to enhance peer interaction, Eman Al-Najjar and Muhannad Salman recommended providing teachers with resources, including templates and examples for creating learning materials.

Based on this feedback, the Proposed model was further developed as follows

First, analyze learner characteristics and break down content into small goals to be presented through microlearning. Then proceed with the following steps:

1. Start with the most important (priority) goal.
2. Provide a micro-task related to that goal, along with a short video or text via an asynchronous platform.
3. Learners can ask questions and share experiences with one another through the asynchronous platform.
4. Submit the final task solution asynchronously. The trainer/teacher provides individual or general feedback.
5. Conduct a synchronous meeting where the trainer/teacher gives final feedback and shares solutions.
6. Repeat from step 1 with the next goal in order of priority.

Figure 5 shows the updated Proposed model.

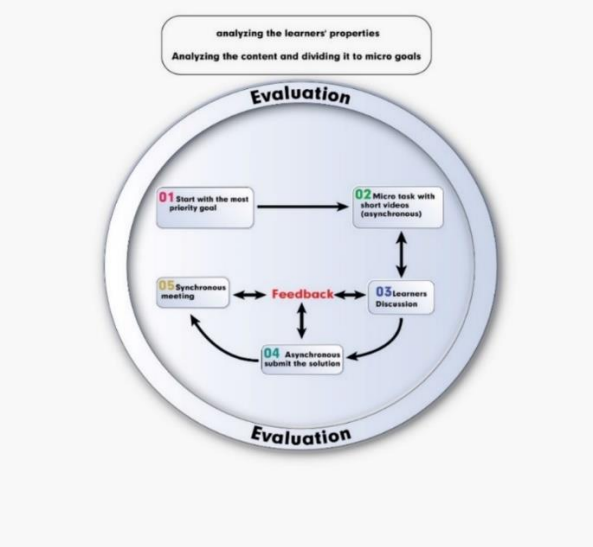

Figure (5): sequence steps of the Proposed model in eLearning, the second version 2024.

To answer the second question: To what extent has the Proposed model been adopted by experts and supervisors based on Rogers' process for diffusion of innovations?

Relative Advantages: John Bergman said, "I think the model could be important for online learning. For learners, I think it could really help them. I think it's a good model and its conception."

Eman Al-Najjar, Shukri Qatt, and Ruqayyah Abu Al-Rub highlighted the model's role in developing digital competencies, integrating digital tools, and fostering critical thinking.

Doaa Ghosheh/Wahbeh and Sharon Sawan noted it guides teachers to engage learners and promote responsibility for online learning. Attiah Ismail emphasized that it accommodates individual differences, while Ghosheh/Wahbeh and Sawan added that its microlearning approach reduces cognitive load, promotes deep understanding, and helps learners focus effectively on tasks.

Sharon Sawan emphasized the model's value for learners facing challenges in in-person learning, especially in emergencies. She noted its focus on multi-stage feedback, ensuring consistent teacher-learner interaction in distance learning. Supervisors agreed it organizes flipped learning with clear steps and supports application in both face-to-face and virtual settings.

Regarding its importance for learners, supervisors agreed that the model enhances self-learning motivation, which improves the quality of learner-centered education. It clearly defines the learner's role and promotes deep understanding of the educational goal by focusing on one small goal per task.

Complexity and Flexibility: John Bergman considered the model clear and flexible, stating, "I liked it. Its steps are clear, and it is a linear approach." Eman Al-Najjar, Shukri Qatt, and Fattom Amara also found the model clear and easy to use due to its logically structured steps. They viewed it as flexible because teachers can apply it across different subjects.

Sharon Sawan described it as adaptable, as it is based on micro-tasks and the repetition of the same steps helps teachers develop a learning routine. She also noted that the model remains accessible and straightforward without oversimplifying the learning process or omitting important elements (e.g., feedback, synchronous meetings). Thus, the Proposed model is considered both easy to use and flexible.

Compatibility: Experts and supervisors agreed the model suits various subjects and learner levels. Doaa Ghosheh/Wahbeh noted challenges with early grades (1–3) but recognized its benefits for time management. Eman Al-Najjar, Shukri Qatt, Fattom Amara, and Sharon Sawan stated it fits learners of all ages. Supervisors affirmed it addresses individual differences, develops digital skills for teachers and learners, and works in both online and face-to-face settings, making it highly compatible.

Observability: All experts and supervisors agreed that the Proposed model is observable, as its steps are very clear. Its foundation on microlearning makes learning goals measurable and specific. Moreover, the availability of feedback at all stages further reinforces this transparency.

Trialability: The model is trialable, as the first version was improved after practical implementation. This was evident from the modifications suggested by experts and supervisors following their training (in the case of supervisors) and evaluation of the model (by experts).

To answer the third question: To what extent has the Proposed model been adopted by experts, supervisors, and teachers based on Rogers' process for diffusion of innovations?

To address this question, the following null hypotheses were tested:

- There are no significant differences at $\alpha \leq 0.05$ in the mean responses of participants on the questionnaire regarding adoption of the Proposed model attributed to teachers' gender.
- There are no significant differences at $\alpha \leq 0.05$ in the mean responses of participants on the questionnaire attributed to teachers' years of experience.

– There are no significant differences at α ≤ 0.05 in the mean responses of participants on the questionnaire attributed to the teachers' country of origin.

Data were collected from the adoption questionnaire and analyzed using the SPSS statistical program. The means and standard deviations were calculated within and across the domains of the questionnaire. The total mean score of the questionnaire was 4.22, with a standard deviation of 0.42, indicating a high degree of acceptance and agreement with the attributes of the Proposed model, as shown in Table 5.

Table (5): Criteria level of acceptance.

Level period	1.00-1.80	1.81-2.61	2.62-3.42	3.43-4.23	4.24-5
Level of acceptance	Very low	Low	Medium	High	Very high

Table (6): Means and Standard Deviation for Teachers' Responses to the Domains of the Proposed Model Adoption Questionnaire.

	Domain					
	Relative Advantage	**compatibility**	**Complexity**	**Trialability**	**Observability**	**Total**
Mean	4.38	4.12	4.29	4.26	4.03	4.22
Std. Deviation	.48	.47	.51	.50	.47	0.42
Degree of acceptance	Very high	high	Very high	Very high	high	High

Table 6 results showed that the teachers highly accepted the model in general, with very high acceptance of the attributes of relative advantage, complexity, and trialability of the Proposed model, and high acceptance overall, indicating that they adopted the Proposed model according to Rogers' process of diffusion of innovations.

To compare the teachers' responses according to gender, we used the independent-samples t-test to test the first hypothesis, which states: "There are no significant differences at α ≤ 0.05 in the means of the responses of participants on the questionnaire for adopting the Proposed model attributed to the participants' gender." The data analysis is shown in Table 7.

Table (7): Independent-samples t-test for the first hypothesis.

Domain	**Mean**		**Mean Difference**	**Std. Deviation**		**t**	**Sig. (2-tailed)**
	Male	**Female**		**Male**	**Female**		
Relative Advantage	4.32	4.40	-0.08	0.53	0.46	-0.85	0.40
compatibility	4.14	4.12	0.02	0.45	0.48	0.225	0.82
Complexity	4.24	4.31	-0.07	0.52	0.51	-0.75	0.46
Trialability	4.20	4.28	-0.08	0.51	0.50	-0.845	0.40
Observability	3.97	4.06	-0.09	0.50	0.46	-0.94	0.35
Total Mean	4.17	4.24	-0.06	0.44	0.41	-0.74	0.46

Table 7 showed that there was no significant difference in the responses of males (M = 4.17, SD = 0.44) and females (M = 4.24, SD = 0.41), which means acceptance of the first hypothesis. Thus, both males and females showed high acceptance of the attributes of the Proposed model and adopted it.

To compare the means of the teachers' responses regarding years of experience, we used the One-Way ANOVA test. The results in Table 8 show the outcome of testing the second hypothesis, which is: *There are no significant differences at α ≤ 0.05 in the means of the responses of participants on the questionnaire*

for adopting the Proposed model attributed to the participant's years of experience.

Table (8): One-Way ANOVA test for the second hypothesis.

ANOVA						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Relative Advantage	Between Groups	.65	5	.130	.556	.73
	Within Groups	27.18	116	.23		
	Total	27.84	121			
compatibility	Between Groups	1.81	5	.36	1.702	.14
	Within Groups	24.68	116	.21		
	Total	26.49	121			
Complexity	Between Groups	1.02	5	.20	.771	.57
	Within Groups	30.53	116	.26		
	Total	31.55	121			
Trialability	Between Groups	.45	5	.09	.347	.88
	Within Groups	30.22	116	.26		
	Total	30.68	121			
Observability	Between Groups	1.16	5	.23	1.036	.40
	Within Groups	25.94	116	.224		
	Total	27.10	121			
Total mean	Between Groups	.71	5	.14	.80	.55
	Within Groups	20.48	116	.18		
	Total	21.19	121			

The results in Table 8 showed that there was no significant difference in the responses regarding years of experience. Thus, the results indicate a high acceptance of the attributes of the Proposed model and its adoption regardless of teachers' years of experience.

To test the third hypothesis, which states, "There are no significant differences at $\alpha \leq 0.05$ in the means of the responses of participants on the questionnaire for adopting the Proposed model attributed to the participant's state," we used a One-Way ANOVA test, as shown in Table 9.

Table (9): One-Way ANOVA test for the third hypothesis.

ANOVA						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Relative Advantage	Between Groups	2.67	12	.22	.96	.49
	Within Groups	25.12	109	.23		
	Total	27.84	121			
compatibility	Between Groups	4.00	12	.33	1.62	.10
	Within Groups	22.49	109	.21		
	Total	26.49	121			
Complexity	Between Groups	2.72	12	.23	.86	.59
	Within Groups	28.85	109	.26		
	Total	31.55	121			
Trialability	Between Groups	2.38	12	.20	.76	.67
	Within Groups	28.30	109	.26		
	Total	30.68	121			
Observability	Between Groups	3.34	12	.28	1.28	.24
	Within Groups	23.75	109	.22		
	Total	27.09	121			
Total mean	Between Groups	2.30	12	.19	1.10	.37
	Within Groups	18.90	109	.17		
	Total	21.19	121			

Table 9 shows that there was no significant difference in the responses regarding years of experience and state; thus, the results showed high acceptance of the attributes of the Proposed model and adoption of it regardless of the teachers' state.

Summary

The qualitative results obtained from the educational experts and supervisors who participated in evaluating the Proposed model indicated that it is more organized and clearer. These results led the researchers to modify the second edition of the model. Additionally, the results showed that the model's attributes enable its adoption following Rogers' Diffusion of Innovations process. The quantitative results from the teachers' responses agreed with the qualitative findings, yielding strong data that support adopting the model according to Rogers' DOI.

Results and Discussion

This study used Rogers' diffusion of innovations to adopt the Proposed model in eLearning, evaluated by teachers, experts, and supervisors, who highly accepted it as innovative (Dibra, 2015; Ghosheh Wahbeh et al., 2023; Taylor et al., 2018). Questionnaire results showed strong acceptance of the five innovation characteristics—relative advantage, complexity, compatibility, trialability, and observability—consistent with expert and supervisor feedback, supporting the use of mixed methods (Dibra, 2015; Eichler & McDonald, 2021; Ghosheh Wahbeh et al., 2023; Rogers, 2003; McDermott, 2023; Ruisánchez et al., 2022).

The model provides an active approach to using technology in education based on constructivist principles, helping learners build knowledge, think critically, and innovate (Ozden et al., 2024; Liu et al., 2024). It also supports teachers in integrating technology effectively, aligning with findings that higher teacher competencies positively impact students' technical skills (Crompton & Sykora, 2021; Fütterer et al., 2023).

Furthermore, the findings identified the Proposed model as a suitable instructional design model for all learners and subjects. This strengthens the model's relevance to pedagogy and andragogy, consistent with understandings of learning and training (Jeanes, 2021; Noor et al., 2012). The model begins by analyzing learners' needs before learning starts, in agreement with the results of Wilson et al. (2024).

Descriptive results support the quantitative findings on relative advantage: teachers highly accepted the model, while experts and supervisors noted its use of micro goals for deep learning, aligning with Díaz Redondo et al. (2021). The model also enhances digital skills and critical thinking, consistent with Imjai et al. (2024).

Results showed high compatibility, observability, and very high simplicity and trialability. Its use of microlearning, flipped learning, and clear steps makes it suitable for all subjects and learner levels, accommodating individual differences, aligning with Rof et al. (2024) on microlearning's positive impact on learner satisfaction.

Conclusion, Recommendations, and Future Work

This study aimed to adopt the Proposed model in eLearning as an innovative model using Rogers' Diffusion of Innovations. Adoption involved presenting, using, and evaluating the model, allowing participants to decide on its use. Results led to a revised edition, with experts and supervisors (internal validation) and teachers (external validation) confirming its adoption and innovative status per Rogers' DOI.

The results showed that the model is effective, transforming education into an

active, learner-centered process. It raises motivation, increases interaction, develops teachers' and learners' eLearning skills, and supports self-directed learning. The model enhances use of digital tools, teacher-learner and technology relationships, organization of the educational process, positive attitudes toward technology, lifelong professional development, and learners' social-emotional skills.

Thus, the study recommends:

- **Publish the Proposed Model**: Actively encourage the adoption of and share the Proposed Model with teachers, instructional designers, and education professionals across various educational institutions to raise awareness of its structure and benefits.
- **Implement the Proposed Model as an Instructional Design Framework**: Apply the Proposed Model as a guiding framework for designing and delivering eLearning experiences, ensuring a structured, learner-centered approach.
- **Conduct Empirical Research on Younger Learners**: Carry out further studies to examine the effectiveness and appropriateness of the Proposed Model for early learners, specifically targeting students in grades 1 through 4.
- **Integrate into Teacher Professional Development**: Incorporate the Proposed Model into training programs aimed at developing teachers' competencies in instructional design and eLearning, making it a central component of ongoing professional development.

Disclosure Statement

- **Ethical Approval and Consent to Participate:** This study was conducted in accordance with ethical standards.
- **Availability of Data and Materials:** The datasets generated and/or analyzed during the current study are available from the corresponding author (Hilmi Raouf Hamdan) on reasonable request.
- **Author Contribution:** Hilmi Hamdan conceptualized the study, developed the Proposed Model framework, conducted the analysis, and wrote the manuscript. The Second author(Ammar Miloud) reviewed and approved the final version of the manuscript.
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