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Implementing Integrated KARDS Modules on Teachers' Pedagogical Content Knowledge: A Quantitative Investigation

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Abstract: The current survey is scaffolded on post-transmission pedagogy and heutagogy training with a technology-incorporated model. The researchers endeavored to incorporate an integrated version of KARDS (Knowing, Analyzing, Recognizing, Doing, Seeing) modules. The researchers employed convenience sampling to allocate 75 teachers into three classes. The groups were designated as heutagogy-focused, cybergogy-focused, and control groups. The instruments include an Oxford placement test, a knowledge, and technology TI-KARDS test. The application of cybergogy focused group was based on the framework introduced by Kumaravadivelue (2012), and the tenets of TPACK were proposed by Mishra and Koehler (2006). The implementation of a heutagogy focused group was based on the framework introduced by Kumaravadivelue (2012), and the tenets of heutagogy were investigated by Hase and Kanyon (2013). Through the heutagogy-focused phase, micro-learning, and micro-teaching techniques were used. Microlearning tools such as telegrambots and Chat-GPT were used. Through the cybergogy-focused phase, TPACK standards were introduced, and micro-learning tools such as YouTube and weblogs were used. One-way ANOVA indicated the three groups were homogenous. The findings revealed of two ANCOVA and post-hoc comparisons revealed that the heutagogy group significantly performed better than the cybergogy group and the control group on the post-test of pedagogical content knowledge and TI-KARDS test. The cybergogy group significantly performed better than the control group on the post-test of pedagogical content knowledge and TI-KARDS.

Keywords: Cybergogy, Heutagogy, KARDS, Technology integrated KARDS

Introduction

Contemporary teacher professionalism has significantly emphasized knowledge integration in education (Lehmann, 2020). The vision underlying this survey includes empowering teachers in diverse areas of knowledge (Lehmann, 2020; Reigeluth & Carr-Chellman, 2009). The emergence of affordance-integrated pedagogy may be beneficial in the teachers' professional improvement, regardless of the geographical location (Walsh & Man, 2019). Further, recent research is paving new horizons and shifts toward heutagogy and cybergogy (Hase &Kanyon, 2013; Mishra & Koehler, 2006). This has become an issue of great importance recently due to technology enhancement and globalization issues.

Out-of-dated theories are regularly criticized for their restricted and insufficient influences on training. Besides, teachers' epistemology requires metamorphosis in the direction of pedagogy. First phase of the problem is linked to integrated domains of teacher knowledge. In this vein, If the teaching

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profession doesnot grasp and embrace the various domains of knowledge associated with instruction and the various means they are taught and learned, teacher edification will continue to be epistemologically bankrupt and regarded as a Philistine vocation (Kincheloe, 2004).

Another problem is that educators lacks undrestanding and knowing about the notions of cybergogy and heutagogy. A recurring problem is the teacher's limited understanding of the knowledge areas. To efficiently prepare students for the demands of the 21st century, English educators require to possess pedagogical awareness and deep comprehension of heutagogical tenets in the instructional practices. Many educators may have limited awareness and comprehension of the concept of heutagogy, which is associated with self-determined learning. It's possible that they don't know the principles of hetagogy. Lack of awareness can interfere with their ability to design and facilitate student-driven projects (Bizami et al., 2023).

Furthermore, traditional instructional paradigms in English language teaching frequently put emphasis on teacher-led instruction and assessments. Traditional models can hinder the opportunities for learner agency, self-directed learning, critical thinking, and collaboration, which are vital aspects of heutagogy. English educators may find it difficult to redirect their teaching practices toward a more heutagogical orientation. Teachers may find it hard to update their teaching practices and incorporate heutagogical principles effectively if they lack adequate professional development. Therefore, Iranian teachers' knowledge must be updated in an integrated manner based on instructional designs. The Iranian teachers need a paradigm shift towards heutagogie and cybergogy.

In this study heutagogy and cybergogy are merged in segments of KARDS. The researchers aim to address this issue by integrating two designs, adapted from Kumaravadivelu (2012), and Mishra & Koehler (2006). The notions of heutagogy and cybergogy are embeded inside these two designs. One of them is emerged as a technological design and the other one is proposed as a pedagogical instruction. With the rise of technology, new issues are scaffolding educators' professionalism. The cybernetic zone pay attention to cybergogy by observing the principles and standards related to instructional technology design. In the field of ICT, some researchers have argued that combining the basics of cybergogy, pedagogy, and heutagogy is key for generating a novel approach in education (Carrier & Moulds, 2003; Coomey & Stephenson, 2001).

In this vein, earlier studies frequently implemented the technology oriented (TPACK) theory to investigate its impact on learners and teachers in various fields (Joo et al., 2018; Santika et al., 2021; Yang et al., 2019). Although some attempts have been made to address this issue, it still requires more investigation in other combined domains such as heutagogy and post-transmission pedagogy. In this case, to fill the underpinning gaps, integrated domains of pedagogy should be established and applied by EFL trainers. Currently, the infrastructure of contemporary education has transformed, becoming more heutagogy-constructed, multichannel, and cybernetic-driven (Valiathan, 2022).

Accordingly, the chief rationale behind conducting the current study is developing integrated domains of knowledge among Iranian EFL teachers. Despite a gargantuan amount of research on technology integration (e.g., Adipat, 2021; Azhar & Hashim, 2022; Fahadi & Khan, 2022) and KARDS (e.g., Hassani et al., 2019; Lestariningsih, 2018), approximately a scarcity of research specifically linking the impact of post-transmission modules on teachers' knowledge exists within Iranian investigations. In addition, there was no survey conducted to examine the impact of the TI-KARDS on Iranian EFL teachers' knowledge. Thus, the current study is anticipated to fill this gap.

Literature Review

Post-Transmision Pedagogy (KARDS)

Kumaravadivelu (2012) examined the five elements of the KARDS model: knowing, analyzing, perceiving, acting, and seeing. In 2012, he started the KARDS infrastructure, which has evolved into one of the leading frameworks for post-submission modules in education. The first module contains

three types of knowledge: personal, professional, and practical. The second module deals with learner needs, wants, and situations. The concept of recognizing is realized through (a) self-assessment, (b) peer assessment, and (c) teacher assessment for educator training. Doing phase can be categorized into micro-teaching, team-teaching, and self-study. Seeing involves understanding the gap between (a) the learner's perspective, (b) the teacher's perspective, and (c) the observer's perspective of educational action (Kumaravadivelu, 2012).

Heutagogy

Heutagogy is defined as the study of self-determined learning by the learner himself (Hase & Kenyon, 2000). Heutagogy existed throughout the fourth industrialized revolution in Australia to promote self-determination in learning (Hase & Kenyon, 2013). Heutagogy is a bonus merit to pedagogy, andragogy, synergogy, and cybergogy (Balshake, 2012). Novices autonomously take accountability for knowledge and control what they study, when they learn it, and how they learn it (Stoszkowski & Collins, 2017). Principally, the pivotal tenets are skills improvement, self-reflection, metacognition or comprehending of the self-learning process, double-loop learning, and non-linear processes (Blaschke & Hase, 2016).

Cybergogy

The use of ICT (Information and Communication Technology) has created a new teaching and learning concept in education pedagogy known as cybergogy. Cybergogy concept is a virtual learning environment for the advancement of cognitive, emotional, and social learning of the students (Wang, 2008). Engaging novices on all three tiers of presence concurrently might bring about the satisfactory studying outcomes. The cybergogy approach can be carried out anyplace and every time based on the availability of computer systems and the internet (Bizami et al., 2023). In the era of globalization, the rise and progress of ICT during the industrial revolution 3.0 has given rise to the concept of cybergogy (Wang, 2008).

Cybernetic models have been developed through the evolution of ICT. One of the cybernetic frameworks is TPACK. TPACK's cybernetic structure is regarded as a framework for cybergogy-focused fusion in this analysis. TPACK embraces technological-related knowledge, pedagogical-related knowledge, and content-related Knowledge (Mishra & Koehler, 2006). It is extended as an ICT-TPCK and is offered by (Angeli & Valanides, 2009). TPACK based on ICTs has added importance to technology in advanced education as it combines context (X) and the learner's (L) knowledge. TPACK-XL is regarded as the enhanced new version of information technology-TPCK, which illustrates several amalgamated information constructs that synthesize to correspond to its knowledge base and thus function as an updated ICT-TPCK lens for instructor Edification students. In the KARDS module model, knowledge can be classified into professional, personal, and procedural knowledge (Kumaravadivelu, 2012). This study focused on TI-KARDS, a new pedagogical content knowledge model that integrates technology.

Microteaching

A micro-teaching method was designed based on TI-KARDS pedagogy in this study. It is a method of pre-service teacher development, that creates opportunities for teachers to practice a teaching method in artificial learning environments that comprise their peers as learners (Etkina, 2010). Studies have evidenced that microteaching activities support preservice teachers' development of PCK, technological pedagogical content knowledge, and knowledge about reform-based teaching methods (Etkina, 2010; Niess, 2005). In-service teachers plan a teaching activity in groups (involving at least 3 teachers for most of the time) and one of them implements the plan while other group members observe the practice. Then, the group members discussed the plan and made certain modifications, considering the results of these discussions. Afterward, another member of the group implemented the new plan for different but a similar group of students. This circulation lasts to observe the desired student learning outcomes (Cavin, 2007; Eraslan, 2008). Studying in groups, making reflections, and modifications are

accepted as the advantages of this professional development method (Cavin, 2007). A microteaching lesson study, a pragmatist blend of microteaching and lesson study, is a preservice teacher training method (Fernandez, 2005).

Micro-learning

A micro-learning method was designed based on TI-KARDS pedagogy in this study. Microlearning is a pedagogical learning method employed to aid the professional growth of users via various online platforms (Lee et al., 2021). It refers to short-term learning activities based on small pieces of information, brief video segments, short podcasts, etc (Reinhardt & Elwood, 2019). The pedagogical design of micro-learning allows students to develop self-regulated skills and lifelong learning capacities (Reinhardt & Elwood, 2019).

Pedagogical Content Knowledge

The special fusion of content and pedagogy that is exclusively the domain of teachers, their particular form of professional understanding, advanced through an integrative process embedded in classroom practice (Shulman, 1987).

Empirical Studies on Integrated Designs

Lestariningsih (2018) in his research mentioned that the K (plus one) ARDS model used as a preliminary study to improve English teachers' competencies in higher education. The model demonstrated positive outcomes for college English educators. This plan was originally made for individuals who want to become L2 teachers. But with some reforms, it can assist in the improvement of in-service English teachers' competencies. Few kinds of research have been done on KARDS in Iran. Research on teachers' identity was done by Hassani, Khatib, and Yazdani Moghaddam (2019) based on the KARDS model. Mahmoodarabi et al. (2021) considered the KARDS model to develop a scale for teachers' professional development.

Zhang and Tang (2021) in his article reviewed integrated sorts of TPACK development approaches and models such as learning by design approach, Lesson Study, microteaching, microteaching lesson study (MLS), SQD-model (Synthesis of Qualitative Evidence) (Tondeur et al., 2012), TPACK-COPR (Comprehension TPACK, Observation of instruction, Practice of instruction, and Reflection) (Niess et al., 2009) TPACK-IDDIRR (Introduce, Demonstrate, Develop, Implement, Reflect, and Revise) (Lee & Kim, 2014), and TPACK-COIR (Comprehension, Observation, Instruction, and Reflection) (Jang, 2010). The TI-KARDS intervention also offers some references for researchers and educators to develop teachers' TPACK through KARDS pedagogy.

All in all, the previous studies showed the efficiency of TPACK and KARDS in developing teachers' skills, identity, and their findings also indicated that teachers adopted positive views towards its implementation in EFL classrooms. Therefore, in line with the above-mentioned studies, this study is an attempt to investigate the effects of the technology-integrated KARDS on Iranian EFL teachers' pedagogical content knowledge. The technology integrated-KARDS model was the theoretical framework underpinning the present research. An investigation was undertaken to determine whether Iranian EFL teachers' pedagogical content knowledge would increase with a technologically integrated KARDS course. The contemporary study is estimated to respond to the subsequent research questions:

Research Question One: Does heutagogy-focused TI-KARDS significantly impact Iranian EFL teachers' pedagogical content knowledge assessed through the knowledge test and technology integrated-KARDS test?

Research Question Two: Does cybergogy-focused TI-KARDS significantly impact Iranian EFL teachers' pedagogical content knowledge assessed through the knowledge test and technology integrated-KARDS test?

Method

Design

The survey is a quasi-experimental design in the quantitative phase. It comprises the pretests and posttests, and the purpose was to measure the effects of the integrated instructional designs on Iranian EFL teachers' pedagogical content knowledge.

Participants

A sample of 75 Iranian EFL teachers was designated. In addition to male teachers, there were also female teachers. The initial population was required not to have any previous familiarity with KARDS or TPACK courses. The age of the partakers were between 19-28 years old. The survey was conducted in a private institute in Karaj. The convenience (availability) sampling procedure was applied to designate the members. Convenience sampling is a type of sampling in which partakers who are easily accessible and available are chosen to take part in the study (Dornyei, 2007). The initial population of the study was 75 EFL teachers, who joined in teacher training classes. Accordingly, Three intact classes were utilized as the research sample. The designated members on the basis of the Oxford placement test scores were non-randomly categorized into two treatment and control groups. Intervention groups were the heutagogy-focused KARDS and the cybergogy-focused KARDS groups. The control group was termed TI-KARDS.

Instruments

Oxford Placement Test

Oxford placement test was implemented to homogenize the members regarding their knowledge prior to the application of the intervention. It consists of 50 items in the form of multiple-choice questions. It took 70 minutes.

Knowledge Test and TI-KARDS Test

To meet the needs of the present study, three instruments were used: an Oxford placement test, a pedagogical content test, and a technology-integrated KARDS knowledge test. Three groups were dichotomized into a control group of TI-KARDS, heutagogy-focused TI-KARDS through micro-learning and micro-teaching techniques, and cybergogy-focused TIKARDS through micro-learning tasks. Afterward, to implement the model, the teacher's pedagogical content test and technology-integrated KARDS knowledge test were utilized. The pedagogical content test and technology-integrated KARDS knowledge test were utilized as the pretest and posttest. Each test consisted of 20 multiple-choice questions in each test. As a whole, they respond to 40 items. The participants responded to the questions in 60 minutes.

KR-21 Reliability Indices for Tests

The reliability indices for the Oxford placement test were .88, pretest and post-test of technology-integrated KARDS had KR-21 reliability indices of .74, and .83. Moreover, the reliability indices for the pretest and posttest of pedagogical content knowledge were .78, and .90. These reliability indices can be considered to be reliable. as noted by Fulcher and Davidson (2007) who believed that, tests that do not achieve reliabilities of 0.7 are normally considered to be too unreliable for use.

Criterion Referenced Validity Indices for Tests

The outcomes indicated that the Oxford placement test had significant correlations with the pretest ($r(73) = .790$ representing a large effect size, $p < .05$), and post-test ($r(73) = .771$ representing a large effect size, $p < .05$) of technology integrated KARDS. It also had significant correlations with the pretest ($r(73) = .626$ representing a large effect size, $p < .05$), and post-test ($r(73) = .677$ representing a large effect size, $p < .05$) of pedagogical content knowledge. Based on these outcomes, it can be concluded that the pretest and post-test of technology integrated KARDS, and the pretest and posttest of pedagogical content knowledge enjoyed significant criterion-referenced validity indices.

A Micro-teaching lesson study

A micro-teaching lesson study was designed on the basis of TI-KARDS pedagogy. Microteaching as an approach to teacher growth assists teachers in teaching practices in artificial learning environments that comprise their peers as learners (Etkina, 2010). Microteaching activities were utilized for teachers' advancement of PCK, technological pedagogical content knowledge, and KARDS modules. Micro-teaching was based on the integrated model of TI-KARDS with the dialogic conversation about the concepts of KARDS and TPACK. The instructor guided the groups in reviewing TPACK and supported them in revising their understanding of concepts.Teachers plan a teaching activity in groups (involving at least 3 teachers for most of the time) and one of them implements the plan while other group members observe the practice. Then, the group members discussed the plan and made certain feedback, considering the results of these discussions. The objective was to assist teachers' reflection, dialogic feedback, and assessment.

A Micro-learning Lesson Study

A micro-learning lesson study was designed based on TI-KARDS pedagogy. Microlearning was implemented to assist the specialized improvement of participants through various online technological tools. Accordingly, the micro-teaching tasks consist of colleagues' voice-recorded practices and dialogic feedback. The teachers teach the learned material of micro-learning tasks for 15 minutes or 30 minutes. The micro-learning tasks consist of short videos and YouTube teaching. Besides, microlearning tools were ChatGPTbot and YouTube. In this phase, novice teachers learn about content and assessment of skills. They give comments about the shared material. Also, they learn about the pedagogy of instructional designs such as KARDS modules, TPACK principles, and heutagogy principles in shared videos. The control group received the material through PowerPoint and they did not receive micro-learning or micro-teaching practices.

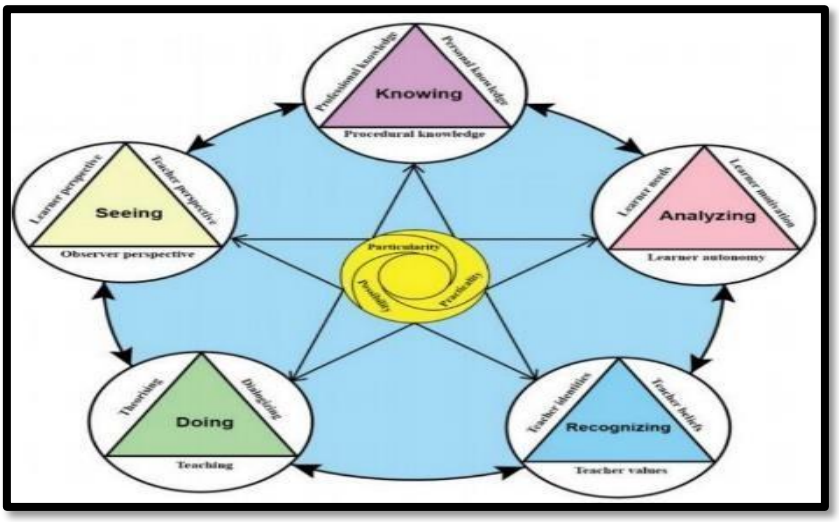
Data Collection Procedure

The initial population was required not to have any previous familiarity with KARDS or TPACK courses. The age of the participants was between 19-28 years old. This study was conducted in a private institute in Karaj. Initially, the Oxford Placement Test was administered to 75 EFL teachers to homogenize the participants regarding their knowledge. Accordingly, Three intact classes were used as the research sample. The selected participants, based on the OPT scores, were non-randomly divided into two experimental groups and a control group. Heutagogy-focused TI-KARDS group received training based on principles of heutagogy, technology, and KARDS modules. Cybergogy-focused TI-KARDS group received training based on principles of TPACK, and KARDS modules. The control group received training based on KARDS modules. Teachers' knowledge test and technology integrated KARDS test were administered as the pretests. The aim of the study and the course guidelines were explained to teachers. Then, the participants received 10 sessions as the intervention, and the allocated time for each was 90 minutes. Two experimental groups were exposed to the prepared package entitled TI-KARDS package. Finally, teachers' knowledge and technology-integrated KARDS tests were administered as posttests. The contribution to theory in this study refers to the improvement of the

diagnostic framework of the study, which is adapted from the integration of the technology model and five modules post-transmission model. This framework has been utilized in this research for the first time. Remarkably, the infrastructure pursued re-contextualizes the proposed model by considering integrated constituents within the KARDS model. According to Kumaravadivelue (2012), KARDS as a kind of instructional design is divided into five main phases: the knowing stage, analyzing stage, recognizing stage, doing stage, and seeing stage as illustrated in Fig. 1.

Figure 1

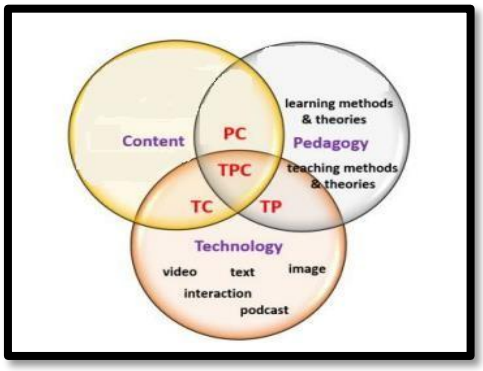
KARDS Phases Adopted from Kumaravadivelue (2012)



The application of cybergogy-focused TI-KARDS was grounded on the framework introduced by Kumaravadivelue (2012), and the tenets of TPACK was proposed by Mishra & Koehler (2006).

Figure 2

TPACK Phases Adopted from Mishra & Koehler (2006)



The framework established by Kumaravadivelue in (2012) and the principles of heutagogy explored by Hase and Kanyon in (2013) are the basis for the implementation of heutagogy-focused TI-KARDS. Another key concept in heutagogy is the doubleloop phase and the reflection of oneself, emphasising the importance of personal values and assumptions. Not only behaviourally but also psychologically,

learners need to take part in the double-loop learning process. Accordingly, they may be able to test their own views and assumptions. Flexibility in the curriculum and evaluation is another important issue addressed by heutagogy. Meanwhile, both leaders and performers in the actions are the learners, they require to recognize what to study and how to assess themselves. In this survey, novice teachers as learners are are self directed individuals in charge of studying and managing the whole process (Blaschke & Hase, 2019; Hase & Kenyon, 2013).

As the result of various experiments chief tenets of heutagogy have been recognized (Blaschke & Hase, 2015, 2019; McAuliffe et al., 2009). The five tiers consisted of learner agency, self-efficacy, metacognition, non-linear study, and undrestanding how to study. The pivotal tenet is learner agency. The apprentices are the main performers for studying, management of learning, content, pedagogy, and the level of learning (e.g., self-evaluation). The second tier is self-efficacy and capability. Thus, self-efficacy is defined as the students belief in their abilities, and capability is defined as the ability of the student to determine a learned competency in unique situations. The third tenet is metacognition and reflection. Reflecting on learning and critically thinking about intake, and procedures of learning is another form of double-loop learning or metacognition.

The fourth phase is non-linear learning. Learner is the director of the learning route. It is sequential, as the students are accountable for the content and pedagogy of learning. The other tenet is undrestanding how to gain knowledge. While it is partially integral in the former tenets, McAuliffe et al (2009) considered this aspect as a fundamental tenet. These tenets are introduced to novice teachers, and the pivotal issues are discussed in the training sessions. Microlearning tasks and telegrambots such as Chat-GPT were utilized to implement the concepts. Then, the results are reflected in the micro-teaching phase.

Generally, to implement the study, Google Meet was used to present the course. A synchronous online course consisting of 12 sessions lasted him 6 weeks. A control group was formed merely to receive PowerPoint presentations and to participate in the pre-test and post-test. Through the heutagogy-focused phase, micro-learning, and micro-teaching techniques were used. Through the cybergogy-focused phase, microlearning techniques were used. The researchers considered ten sessions for implementing the modular model and two sessions for assessing through tests. The trainer utilized the PowerPoint materials that described KARDS content and technology approaches in the control group to train the teachers. The techniques of micro-learning in YouTube and applications were utilized for the cybergogy group. The researchers utilized the techniques of micro-learning and micro-teaching in the heutagogy group. Next, After the course study, teachers used an observation checklist in their classes to assess their performance. At the end of the course, a knowledge test and TI-KARDS test were utilized to assess Iranian teachers' knowledge. Figure 3. Displays the integrated KARDS phases of this survey.

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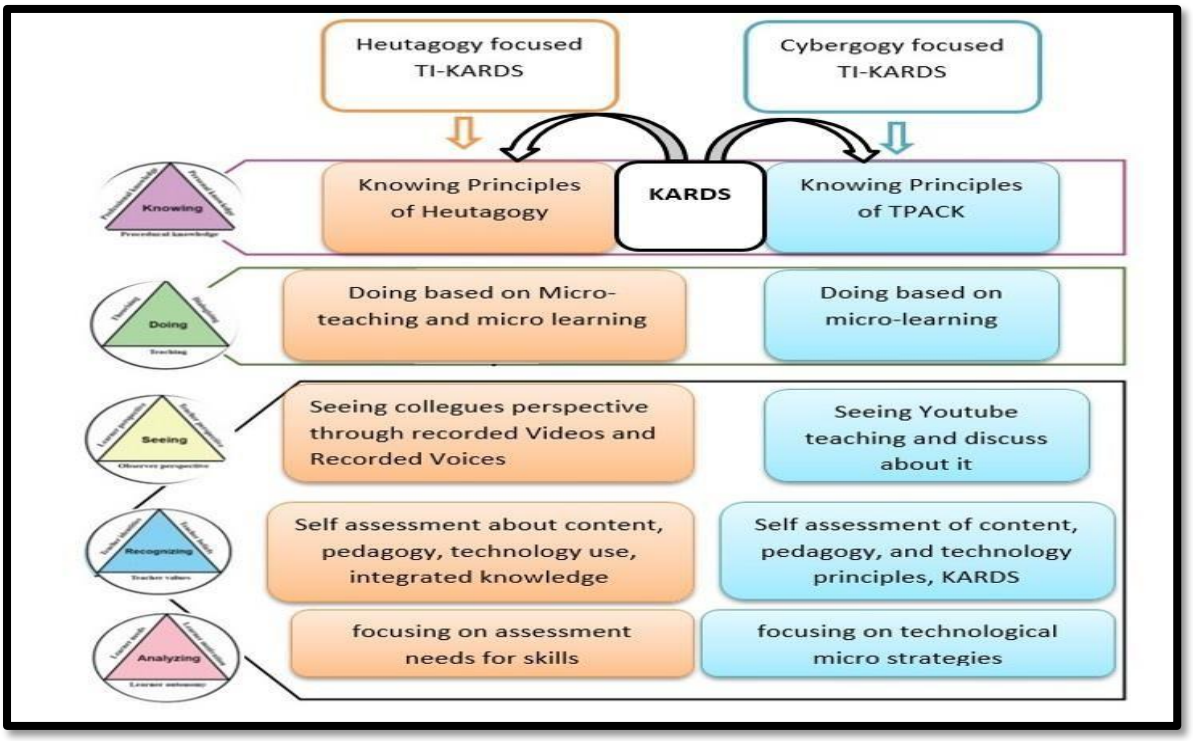
Figure 3

Integrated KARDS Phases Adopted from Kumaravadivelue (2012), Mishra & Koehler(2006), Hase and Kanyon (2013).



In the first session, participants were introduced to three types of pedagogy, cybergogy and heterogogy, through microlearning. The technology integration phase was the introductory part of the training session. The lesson study for the first session was based on knowledge of cybergogy and technology.

Therefore, trainer utilized the resource "Books: integrating technology into the curriculum" to introduce concepts and digital tools. Next, we trainer discussed the categories and purposes of digital tools. The instances are mentioned in the following: 1. Learning management tools: Seesaw, Google Classroom, 2. Interactive presentation: Nearpod, 3. Quiz: Kahoot, Quizizz, , 4. Assessment and feedback Formative: Classick, 5. Collaboration: Padlet, Google Docs, 6. Online library: EPIC, Raz-kids, 7. Websites and online reference: BBC, Word Hippo, 8. Video maker/editor: Screencast-o-matic, 9. Video hosting: YouTube, Edpuzzle, Instagram, 10. Textbook e-resource: Oxford Ready, 11. Authoring Book Creator: Canvas, 12. Synchronous communication: Zoom, Skype, 13. Asynchronous communication: WhatsApp. It focused on the concept of technology in TPACK. The KARDS module as an instructional design was elaborated in the second session of the training course. Further, each module is focused on each session about pedadagogy, heutagogy, and cybergogy issues. The trainer in the second session introduced an integrated method of analyzing novices' needs. The lesson plan for the second session was based on the analysis of technical issues. This part introduces technology integrations, assessments, and definitions of assessment types. The focus was on modules for analyzing KARDS and TPACK.

The third session introduced the recognizing module. The lesson plan for the session was based on recognizing concepts of co-teaching/team teaching concepts in KARDS. Six approaches to co-teaching were featured. In the fourth session, participants received information on co-teaching through micro-learning. The lesson plan for the session was based on the use of video technology in microteaching and the stages of reflective micro-teaching are described. In session five, they were taught the fifth module. The lesson plan for the fifth session was based on seeing the context of (KARDS). The focus was on the reflection and observation through self, peer, and observer.

In session six, pedagogy and technology standards were presented. The lesson plan for the session was grounded on the content knowledge. The focus was on types of skills, productive skills, tasks, and rubrics. In session seven, they practiced based on heutagogy. The lesson plan for the session was constructed on heutagogy principles. An example of integrating a heutagogical approach to productive skills was covered. It was practiced through micro-learning and micro-teaching. In session eight, participants practiced and gave feedback on micro-teaching. The lesson plan for the eighth session was based on micro-learning as a TPACK-teaching technique. The focus was on skills. ChatGPTbot was introduced to participants. Some educators point to ChatGPT as a win for heutagogy, or self-determined learning. ChatGPT can rapidly find information and act as a research or learning assistant. In the academic world, researchers were already using chatbots to organize their thinking, generate feedback on their work, and assist with writing code. ChatGPTbot as a micro-learning tool was used.

As the need analysis was performed among novices, the concept of rubrics and productive skills gained more notice. So, the last two sessions focused on productive skills. The lesson plan for the ninth session was based on an analysis of rubrics in speaking assessment. In session nine, participants reflected on the modules, also wrote comments about them. The lesson plan for the tenth session was based on an analysis of rubrics in writing assessment. In session ten, novices had self-assessments, then that received feedback from their colleagues.

Finally, in each session, the novice teachers shared or presented their micro-teaching for fifteen minutes, and the novice teachers discussed and analyzed the content and pedagogy. The trainer monitored novices' progress on principles and assessments to determine how well they trained. The teacher was responsible for teaching principles giving comments about content and assisting novice teachers if they found a misunderstanding.

Results

Homogenizing Groups on Oxford Placement Test

The means on the OPT test of heutagogy, cybergogy, and control groups were compared using a one-way ANOVA to show that the three groups were homogeneous in general proficiency. It illustrates the consequences of Levene's Test of Homogeneity of Variances. The non-significant outcomes of Levene's test ($F(2, 72) = .404$, $p > 0.05$) showed that the Oxford placement test variances of the groups were homogeneous. On the Oxford Placement test, the means of all groups were compared. The outcomes showed that the heutagogy ($M = 22.12$, $SD = 9.66$), cybergogy ($M = 24.88$, $SD = 8.31$), and control ($M = 25.04$, $SD = 10.49$) groups had roughly equal means on the Oxford placement test.

Table 1

One-Way ANOVA of Oxford Placement Test by Groups

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	134.747	2	67.373	.741	.480
Within Groups	6542.240	72	90.864		
Total	6676.987,	74			

Table 1 displays the outcomes of the one-way ANOVA. The outcomes ($F (2, 72) = .741$, $p > .05$, $\eta 2 = .020$ representing a weak effect size) indicated that there were not any significant differences between the three groups' means on the OPT test. That is to say; the three groups were homogenous in terms of their general language proficiency before the administration of the treatments.

Exploring First Null-Hypotheses

A One-Way ANCOVA was conducted to analyze the heutagogy, cybergogy, and control groups' means on the post-test of pedagogical content knowledge to probe the first null hypotheses.

Table 2

Levene's Test for Homogeneity of Variances: A Post-test on the Pedagogical Content Knowledge

F	df1	df2	Sig.
2.211	2	72	.117

First, a One-Way ANCOVA assumes that the variances of the groups are roughly equal on the post-test of pedagogical content knowledge, i.e., homogeneous variances of groups. The non-significant outcomes of Levene's test (Table 2) considered that the assumption of homogeneity of variances was retained on the post-test of the pedagogical content knowledge test ($F (2, 72) = 2.21$, $p > .05$).

Therefore, it has concluded in the statistical null hypothesis that no significant difference between the two groups' variances on the post-test of pedagogical content knowledge was supported. In other words, all groups enjoyed homogenous variances on the post-test of pedagogical content knowledge. It was considering the null hypothesis that the error variance of the dependent variable is the same in all groups.

Table 3

Testing Linearity: Relationship between Pre and Posttest of Pedagogical Content Knowledge

			Sum of Squares	Df	Mean Square	F	Sig.
Post-Cont. * Pre-Cont.	Between Groups	(Combined)	4470.307	16	279.394	4.771	.000
		Linearity	3398.800	1	3398.800	58.041	.000
		Deviation from Linearity	1071.507	15	71.434	1.220	.284
	Within Groups		3396.413	58	58.559		
	Total		7866.720	74			
Eta Squared			.568				

Second, an ANCOVA employing a one-way design requires a linear relationship between the dependent variable (post-test of pedagogical content knowledge) and covariate (pre-test). The outcomes of the linearity test are presented in Table 3. In the linearity test, significant outcomes were obtained i.e. ($F (1, 58) = 58.04$, $p < .05$, $\eta 2 = .568$ representing a large effect size). It was concluded that the null hypothesis positing that the relationship between the pre and post-test of pedagogical content knowledge was non-

linear was rejected. The pre-test and post-test of pedagogical content knowledge have a linear relationship.

Table 4

Testing Homogeneity of Regression Slopes for Pedagogical Content Knowledge

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Group	69.393	2	34.696	.857	.429	.024
Pretest	3963.422	1	3963.422	97.937	.000	.587
Group * Pretest	228.290	2	114.145	2.821	.066	.076
Error	2792.371	69	40.469			
Total	52812.000	75				

Consequently, in a one-way analysis of variance (ANCOVA), it is assumed that the linear relationship between the pre-test and post-test of pedagogical content knowledge should be roughly equivalent for all groups; i.e., homogeneity of regression slopes. Table 4 displays there is no significant interaction between the covariate (pre-test) and the independent variable (types of treatment) i.e. ($F (2, 69) = 2.82$, $p > .05$, Partial $\eta 2 = .076$ representing a moderate effect size The analysis rejected the statistical null hypothesis that the relationship between the pre-test and post-test of pedagogical content knowledge was non-linear across all groups. In other words, there were linear relationships between the pre-test and post-test of pedagogical content knowledge across heutagogy, cybergogy, and control groups.

The outcomes of the descriptive statistics for the all groups on the post-test of pedagogical content knowledge of the pre-test showed that the heutagogy group ($M = 29.78$, $SE = 1.32$) had the highest mean in the post-test of pedagogical content knowledge. It was followed by the cybergogy ($M = 24.88$, $SE = 1.30$) and control ($M = 18.77$, $SE = 1.31$) groups. In the model, the covariates appear at the following values: Pre-Cont. = 16.93.

Table 5

Tests of Between-Subjects Effects for Posttest of Pedagogical Content Knowledge by Groups with Pretest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Pre-test	4214.059	1	4214.059	99.051	.000	.582
Group	1447.259	2	723.630	17.009	.000	.324
Error	3020.661	71	42.545			
Total	52812.000	75				

Table 5 has displayed the pivotal consequences of One-Way ANCOVA. The outcomes ($F (2, 71) = 17.00$, $p < .05$, partial $\eta 2 = .324$ representing a large effect size) ascertained there were significant differences between all groups' means on the post-test of pedagogical content knowledge.

Table 6

Post-Hoc Comparisons Tests for Posttest of Pedagogical Content Knowledge by Groups with Pretest

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Heutagogy	Cybergogy	4.898*	1.874	.011	1.161	8.636
	Control	11.002*	1.893	.000	7.228	14.776
Cybergogy	Control	6.104*	1.847	.001	2.421	9.787

*. The mean difference is significant at the .05 level.

Table 6 displayed the outcomes of the post-hoc comparison tests. Based on these outcomes and the descriptive statistics showndisplayed in Table 4.10, it can be concluded that;

A: The heutagogy group (M = 29.78) significantly performed better than the control group (M = 18.77) on the post-test of pedagogical content knowledge after controlling for the effect of pre-test (MD = 11.00, $p < .05$). B: The cybergogy group (M = 24.88) significantly performed better than the control group (M = 18.77) on the post-test of pedagogical content knowledge after controlling for the effect of the pre-test (MD = 6.10, $p < .05$). C: The outcomes also displayed that the heutagogy group (M = 29.78) significantly performed better than the cybergogy group (M = 24.88) on the post-test of pedagogical content knowledge after controlling for the effect of pre-test (MD = 4.86, $p < .05$).

Exploring second Null-Hypotheses

A One-Way Analysis of Covariance (One-Way ANCOVA) was conducted to compare the means of heutagogy, cybergogy, and control groups on the post-test of technology-integrated KARDS. The assumptions related to One-Way ANCOVA are discussed below.

First, a One-Way ANCOVA assumes that the variances of the groups are roughly equal in the post-test of technology-integrated KARDS, i.e., homogeneous variances of groups. The non-significant outcomes of Levene's test determined that the assumption of homogeneity of variances was retained on the post-test of the technology-integrated KARDS test ($F (2, 72) = .902$, $p > .05$). So, it can be concluded that the statistical null hypothesis was supported and that there was no significant difference between the two groups' variances on the post-test of technology-integrated KARDS. The groups enjoyed homogenous variances on the post-test of technology-integrated KARDS.

Table 7
Testing *Linearity of Relationship between Pretest and Posttest of Technology integrated KARDS.*

			Sum of Squares	df	Mean Square	F	Sig.
Post-Tech * Pre-Tech	Between Groups	(Combined)	753.816	18	41.879	3.044	.001
		Linearity	562.671	1	562.671	40.902	.000
		Deviation from Linearity	191.145	17	11.244	.817	.667
	Within Groups		770.371	56	13.757		
	Total		1524.187	74			
Eta Squared			.495				

Second, a one-way ANCOVA requires that there should be a linear relationship between the dependent variable (post-test of technology-integrated KARDS) and covariate (pre-test). Table 7 displays the outcomes of the linearity test. The significant outcomes of the linearity test; i.e. ($F(1, 58) = 40.90$, $p < .05$, $\eta 2 = .495$ representing a large effect size) ascertained that the statistical null-hypothesis was rejected illustrating that the relationship between the pre-test and post-test of technology integrated KARDS was not linear. In other words, there was a linear relationship between the pre-test and post-test of technology-integrated KARDS.

Table 8

Testing Homogeneity *of Regression Slopes for Technology Integrated KARDS*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Group	117.541	2	58.770	6.429	.003	.157
Pretest	681.536	1	681.536	74.549	.000	.519
Group * Pretest	27.253	2	13.626	1.491	.232	.041
Error	630.808	69	9.142			
Total	15018.000	75				

Finally, a one-way ANCOVA assumes that the linear relationship between the pre-test and post-test of technology-integrated KARDS should roughly equal across the all groups, i.e., homogeneity of regression slopes. The non-significant interaction (Table 8) between covariate (pre-test) and independent variable (types of treatment); i.e. ($F(2, 69) = 1.49$, $p > .05$, Partial $\eta 2 = .041$ representing a weak effect size) ascertained that the statistical null-hypothesis that the relationship between pre-test and post-test of technology integrated KARDS was non-linear across all groups was rejected. In other words, there were linear relationships between the pre-test and post-test of technology-integrated KARDS across all groups.

The outcomes of the descriptive statistics for all groups on the post-test of technology-integrated KARDS represented that the heutagogy group ($M = 16.06$, $SE = .612$) had the highest mean on the post-test of technology-integrated KARDS. This was followed by the cybergogy ($M = 13.04$, $SE = .609$), and control ($M = 11.13$, $SE = .611$) groups.

Table 9

Tests of Between-Subjects Effects for Posttest of Technology Integrated KARDS by Groups with Pretest

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Pre-test	659.700	1	659.700	71.177	.000	.501
Group	303.455	2	151.728	16.370	.000	.316
Error	658.060	71	9.268			
Total	15018.000	75				

Table 9 shows the outcomes of One-Way ANCOVA. The findings ($F(2, 71) = 16.37$, $p < .05$, partial $\eta 2 = .316$ representing a large effect size) showed that there were significant differences between the three groups' means on the post-test of technology-integrated KARDS after taking into account the effect of the pre-test.

Table 10

Post-Hoc Comparisons Tests for Posttest of Technology Integrated KARDS by Groups with Pretest

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Heutagogy	Cybergogy	3.018*	.864	.001	1.295	4.741
	Control	4.923*	.867	.000	3.194	6.653
Cybergogy	Control	1.905*	.862	.030	.187	3.623

*. The mean difference is significant at the .05 level.

Table 10 displays the outcomes of the post-hoc comparison tests. Based on these outcomes and the descriptive statistics, it can be concluded in the following;

A: The heutagogy group (M = 16.06) performed significantly better than the control group (M = 11.13) on the post-test of technology-integrated KARDS after controlling for the effect of pre-test (MD = 4.92, $p < .05$).

B: Similarly, the cybergogy group (M = 13.04) significantly performed significantly better than the control group (M = 11.13) on the post-test of technology-integrated KARDS after controlling for the effect of the pre-test (MD = 1.90, $p < .05$).

C: The outcomes also displayed that the heutagogy group (M = 16.06) performed significantly better than the cybergogy group (M = 13.04) on the post-test of technology-integrated KARDS after controlling for the effect of pre-test (MD = 3.01, $p < .05$).

Discussion

This investigation contributes to the complementary field of knowledge assessment regarding the issues of heutagogy and cybergogy that are embedded in technology integrated-KARDS modules (Blaschke 2012, Hase &Kanyon, 2013; Kumaravadivelu, 2012; Mishra & Koehler, 2006). There are several inquiries about heutagogy as a contemporary framework in various disciplines (Agonács & Matos, 2019; Bhoyrub et al., 2010; Canning, 2010; Canning & Callan, 2010; Elayyan, 2021; Hase, 2009) and its implementations (Blaschke & Marín, 2020; Blaschke, 2021; Chimpololo, 2021; Carpenter & Linton, 2018; Chamo et al., 2023; Moore, 2020; Naqvi & Parvez, 2019). There has been no prior exploration of the term and effect of heutagogy among Iranian researchers. This research fills the gap in this field by reporting the impact of heutagogy TI-KARDS on teachers' pedagogical content knowledge. Below is a summary of the discussions on the research questions.

The positive impact of integrated heutagogy on teachers' knowledge was probed in the first research question. The heutagogy group outperformed the cybergogy and control groups on the post-test of a knowledge test and technology-integrated KARDS test. The present survey confirmed the findings of Blaschke (2012) on heutagogy. Regarding the second research question, the outcomes demonstrated that the cybergogy class significantly outperformed the control class on the post-knowledge test and post- TI-KARDS test. In the present survey, the findings of Panggabean and Wijaya (2021) regarding the positive infuence of cybergogy were confirmed. The outcomes of the survey can be in line with those investigations which focued on the concept of technological pedagogical content knowledge through microteaching tasks in English classes. Also, these findings align with prior surveys that have examined the efficiency of T-PACK in developing teachers' proficiency (Adipat, 2021; Mariette, 2022; Santos & Castro, 2021).

The findings are in line with previous studies that have investigated the effectiveness of heutagogy in education (Jazeel, 2016; Paul & Kumar, 2020; Rinaldi et al., 2022). These findings can be aligned with prior surveys that probed the positive impact of heutagogical methods and probed

whether they can be utilized to reinvigorate autonomous learning among teachers. The results support the prediction of self-determined learning theory that the optimality of a learner's adjustments determines the maximum amount of learning gains (Chacko, 2018). Further, the upshots are in harmony with prior surveys supporting the usefulness of TPACK awareness for advancement in teaching (Dalal et al., 2017; Raygan & Moradkhani, 2020; Saudelli & Ciampa, 2016).

This survey is consistent with other types of research that have examined the positive effects of implementing technology frameworks with other instructional designs and strategies such as micro-teaching. The direction of the research is in line with previous surveys that have probed the positive impacts of integrating micro-teaching with other instructional designs (Jang, 2010; Lee et al. , 2009; Zhang & Tang, 2021).

To sum up, the goal of the survey was to determine the impact of the technology-integrated KARDS course on the educational content knowledge of Iranian educators. The TI-KARDS course improved the performance of educators in the heutagogy-focused group compared to those in the control and cybergogy -focused classes. Therefore, in the post-TI-KARDS and knowledge test, the heutagogy group clearly outperformed the cybergogy group and the control group. In addition, the results showed that the course had a positive impact on the pedagogical knowledge of the participants. Cybergogy and heutagogy have been identified as essential variables for teacher knowledge advancement.

Conclusion and Pedagogical Implications

This survey showed that heutagogy-focused KARDS had significant effects on the improvement of teachers' pedagogical content knowledge through two types of tests. Two research questions were put forth in this study, and statistical analysis revealed that heutagogy produced significantly higher results than cybergogy. Overall, the heutagogy group showed better performance on the post-test of a knowledge test and the TI-KARDS test. The results also showed that the heutagogy group significantly outperformed the cybergogy group and control group on the post-test of technology-integrated KARDS.

Furthermore, it is believed that some of the findings will have some implications for researchers and encourage embarking on further research. This study may inspire researchers and scholars to conduct other types of triangulated and experimental studies in the area of teacher education. Other qualitative-quantitative studies can be conducted using differentiated electronic portfolios to examine other aspects of integrated implementation.

In line with the results, affordance-based research focusing on assessment literacy can be considered in future research. Technological novelties for teachers' professional improvement will aid teachers' training. Furthermore, teachers' integrated assessment based on the technology integrated-KARDS course is recommended for extra investigations. Further reassessments are requisite to identify how other instructional designs can be integrated with KARDS to employ and improve novice teachers' training and assessment. In non-EFL settings, a similar study might be conducted to examine teachers' willingness to integrate types of knowledge with modules designed under KARDS. Another recommendation for supplementary research would be the use of other types of integrated assessment such as dynamic and diagnostic assessment.

In line with the cybergogy focused outputs, application of cybergogy oriented KARDS course on learners' achievement can be an issue for further research. research focusing on learners' skills and critical thinking can be considered in forthcoming research. In line with the heutagogy focused outcomes, application of heutagogy oriented KARDS course on learners` achivement can be an issue for further study. Self-directed learning research focusing on heutagogical knowledge can be considered in future research. This study may encourage researchers to integrate other types of instructional designs with heutagogy to assess teachers.

Extra inquiries are essential to address the limitations of the contemporary inquiry. Each inquiry may be challenged with various limitations, Though, the investigators have attempted to overcome the limitations. The survey had some limitations connected with the survey design and the

samples. Some unwanted variables may influence the route of all surveys. In the phase of the survey, sample size, gender, experiences, and length of time were regarded as limitations.

However, the outcomes of the study are based on the small sample size regarding the participants'features. Forthcoming surveyes could further use a larger sample size with focus on other state-of-the-art issues. This study focused on heutagogy, cybergogy, and TI-KARDS, other types of research may consider the revised form of KARDS modules with other designs. In future work, it may be useful to study particular aspects of KARDS about other cybernetic frameworks. Microteaching and micro-learning tools were used in this study, other types of tools and strategies can be used in other studies. Other types of integrated assessment can be used in further studies.

By dint of the outputs of the investigation, supplementary studies of this sort are commended for considering teachers' and learners' attainments in integrated learning. Supplementary research is recommended to examine the variety of manifestations of the technology-integrated KARDS fundamentals through teachers' knowledge awareness and learners' knowledge diagnosis. It is also possible to extend this study to investigate learners' perceptions and engagement with TI-KARDS. Extra investigations are required to consider the impact of technology integrated-KARDS on learners' achievement through integrated assessment during the course.

Consequently, the findings of this research might be of assistance to ESP educational program makers, ESP syllabus designers, EFL instructors, and EFL apprentices. The findings recommend that language education policymakers propose more technology-integrated designs of language teaching to syllabus creators and educational organizations to create integrated knowledge among teachers and learners, which could lead to their higher levels of awareness of teaching in broad-spectrum and knowledge domains in particular-spectrum. The implications of the current research might assist EFL teachers in Iran in using standards of integrative knowledge and moving from pedagogy toward heutagogy and cybergogy for better knowledge assessment.

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