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developing listening comprehension and e-learning skills among EFL majors**

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Abstract:

The current study aimed at investigating the effect of an electronic adaptive learning environment (EALe) on developing EFL undergraduate students' listening comprehension and e-learning skills, in addition, the study also sought to find out any relationship between three different learning styles (surface, deep and strategic) and both listening comprehension and e-learning skills. To achieve this, five tools were utilized: an EFL listening comprehension test; an e-learning skills test; a self-reflection form; a learning styles inventory (ASSIST) by Entwistle & McCune (2013), and an observation form. Participants of the study comprised of 58 undergraduate EFL majors in the College of Science and Arts in Uqlat Assugour, Qassim University. Results obtained revealed that students listening comprehension skills and e-learning skills have been developed due to the use of the environment and that they have been satisfied with their activities, and that the drawbacks that emerged can be overcome easily in future studies. In addition, strategic learners outperformed surface and deep learners in developing their listening comprehension and e-learning skills.

Keywords: Adaptive learning; Listening comprehension; Learning styles; EFL; e-learning, English language learners

تصميم بيئة تعلم الكترونية تكيفية وأثرها في تنمية مهارات الفهم الاستماعي والتعلم الالكتروني لدى طلاب شعبة اللغة الإنجليزية

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المستخلص:

هدفت الدراسة إلى قياس أثر تصميم بيئة تعلم الكترونية تكيفية قائمة على أساليب التعلم المختلفة (سطحي/ عميق/ استراتيجي) لتنمية مهارات الفهم الاستماعي، ومهارات التعلم الالكتروني لدى طلاب شعبة اللغة الإنجليزية، ولتحقيق ذلك استخدمت الدراسة خمس أدوات هي: اختبار مهارات الفهم الاستماعي؛ واختبار تحصيلي للجوانب المعرفية المرتبطة بمهارات التعلم الإلكتروني؛ وبطاقة ملاحظة لمهارات التعلم الإلكتروني، ومقياس الانطباع الذاتي نحو البيئة التكيفية؛ ومقياس أنماط التعلم (ASSIST) لانتوستل، وتكونت عينة البحث من (٥٨) طالب من طلاب شعبة اللغة الإنجليزية بكلية الآداب والعلوم بعقلة الصقور بجامعة القصيم، وكشفت النتائج عن أثر تصميم بيئة تعلم الكترونية تكيفية على تنمية مهارات الفهم الاستماعي ومهارات التعلم الالكتروني لدى طلاب شعبة اللغة الإنجليزية، كما أكدت النتائج تفوق الطلاب ذوي نمط التعلم الاستراتيجي عن الطلاب ذوي نمط التعلم السطحي والعميق في مهارات الفهم الاستماعي ومهارات التعلم الالكتروني.

الكلمات الرئيسية: التعلم التكيفي؛ الفهم الاستماعي، أساليب التعلم، التعلم الإلكتروني، متعلمو اللغة الإنجليزية.

I. Introduction

The advancement and propagation of the electronic learning technologies necessitate the educational technology designers to create adaptive learning systems that not only nurture the ubiquity of learning (learn anytime anywhere) but also provide personalised learning (Agbo & Oyelere, 2019). Since universities have pivotal digital data about learners used for academic counselling and administrative purposes, designing personalised learning systems becomes genuinely justifiable.

Thanks to electronic learning tools, EFL learners become able to enliven their EFL learning experience through getting exposed to the target language in a real context, communicating with native speakers, connecting with peers, and joining online EFL communities. Thus, e-learning tools, where all the resources, learning or communicating, are fully accessible and reachable, have been found by many researchers to promote foreign language learning and teaching. Kuznetsova & Soomro (2019), for instance, confirmed that e-learning environments provide authentic foreign language learning activities and communication-oriented resources, which are efficient in practicing FL listening.

In other respects, the traditional e-learning systems such as learning management systems (LMS) provide the same content for all the learners congruently (Graf, 2007). In this case, students may find some parts of the content known to them and thus lose eagerness to learn despite insinuating some useful information or skills. accordingly, and as elaborated by (Despotović-Zrakić, Simić, Labus, Milić, & Jovanić, 2013), LMS, though considered by many as an efficient system because it provides activities related to instructors and learners throughout an e-learning process, students with different characteristics or invert needs struggle to benefit and accomplish better involvement. In addition, such courses are so general that they neglect learner's prior knowledge, interests, and needs.

Therefore, to overcome such drawback in the traditional e-learning systems, it is suggested that an adaptive learning system should integrate constructive approaches that meet learners' needs and aptitudes, encourage building on the prior knowledge and then tailor instructional programmes accordingly that might result in accelerated learning and motivation (Graf & Kinshuk, 2012).

One of the main features of the adaptive learning system is that it caters for the principle "one size doesn't fit all". It tries to personalise the process of learning by helping each learner

identify the deficiencies and needed skills, through the responses to different exercises, and then deal with them through recommended tasks and activities. (Alhasan, Chen, & Chen, 2017).

On the other hand, adaptive e-learning system is an impactful educational approach that dynamically revamps the problems of web-based instruction and increases student active involvement. Furthermore, it handles this with the nature of the new generation of students in mind. Such generation is overconnected and never tolerate being away from the internet resources. Thus, to customize such learning experience, designing an environment based on the adaptive learning system requires certain adaptation techniques related to content, presentation and navigation. Bansal (2013: 221) stated that the adaptive web-based techniques incorporate firstly adaptive presentation including adaptive multimedia and adaptive texts. Secondly, the adaptive navigation, which includes adaptive sorting of links, adaptive hiding of links, and adaptive recommendation. In this context, important elements should be taken into consideration: the learning content, teaching approach, and teaching procedures.

Content design in an adaptive e-learning environment is an integrated systematic process. Premlatha & Geetha (2015) suggested that the levels of adaptation would include content, link, presentation, learner, and learning path. This means the adaptation is classified into two main categories: the elements "adapt to" such as the learners' preferences, needs, and learning style and the elements that should be adapted including the content design and navigation system. Similarly, Nakic, Granic, and Glavinic, (2015) stated the most important components which the adapted learning systems should include are learning styles, prior knowledge, and motivation.

Designing an Adaptive e-learning environment demands ontology-based recommenders; a software agent that tries to intelligently recommend actions to a learner based on previous ones. Tarus, Niu, and Mustafa (2018) emphasized that even though learners have extremely distinct qualities, abilities, preferences, learning styles and proficiency levels, recommender systems in a traditional e-learning environment depends on students rating of his preferences regardless of each learner uniqueness. Thus, ontology-based recommenders facilitate customized learning through individualizing the learner profile to provide relevant, required materials and activities.

Moreover adaptive learning environment require other built-in software tools such as leaderboards, and badging systems to fulfill different purposes such as: controlling content that would be shifted to the learner (content co-creation); facilitating tracing the learners' knowledge and progress, and making the best use of the learners' information to recommend adaptive activities according to learners needs. In addition, co-creating instruction, getting instant feedback, and implementing personalised tasks help learners in building proficiency and be more engaged and highly motivated (Khosravi, 2017).

Other important built-in software called (Runtime Verification, RV) is used for detecting the adaptive e-learning system problems. According to Dounas, Salinesi, & El Beqqali (2019), there is an urgent demand to monitor and diagnose the adaptive e-learning systems at runtime to detect and maintain the deficiencies in the learning activities and the environment design. This procedure of detecting the abrupt technical problems promptly helps customize and individualize each student learning experience as well as guaranteed quality of synchronous software development, which leads to present relevant content to each learner.

The design of an adaptive e-learning environment should take into account the preferred learning style so as to personalize the profile of each learner based on his preferences. The distinctiveness of the learning style preference of the learner conduce to the urgent need to customize the learning process based on different resources to meet such unique needs of each learner. Otherwise, learning can be ineffective and unproductive if it does not attend to the preferred learning style of a student (Miklovíková & Malčík, 2016). Thereupon, it is necessary to identify the actual level of performance of the learners, and then to build and sequence the learning materials accordingly. Most importantly, it is required to modify the teaching methods and the tasks in consonance with the learning style preferences of each learner.

On the other hand, a number of adaptive learning systems have been developed to support learning style as a source for adaptation. Popescu (2010); Yang, Hwang & Yang (2013) and Drissi & Amirat (2016) are some of the examples that worth citing. They confirmed that learning style preferences constitute a valuable adaptation tool for improving individual learning among the user features. Furthermore, they revealed that students' learning style can be considered as significant factor that improves the learning performance in web-based learning or e-

learning, achieve high academic results and boost motivation to learn (Drissi & Amirat, 2016).

On this account, Fardon (2013) explained that learning style is the unique favorite learning approach by which students learn best, as well as it refers to the level of readiness and interest of each learner. In the same context, Entwistle (1981) classified the learning styles into three categories: deep, strategic, and surface. Students with deep learning styles relate new information to prior knowledge, argue, inquire, evaluate and find evidence. Strategic learning styles requires a smart involvement with the new knowledge where the learner exert time and efforts to identify the criteria and requirements for learning. Learners who utilize the surface learning style memorize and focus on details.

Whittenburg (2011) tried to integrate such ideas together explaining that adaptive e-learning is an effective environment to personalize education so as to address individual needs where each learner should be concentrating on a unique adapted task based upon his / her particular needs, attitudes, and aptitudes. Such environment includes student-modeling servers that include inferences and detailed information about a learner such as the level of knowledge, preferred learning style, affective characteristics, and even goals and plans. The servers also can monitor each learner's performance on a task such as identifying the time taken and the mistakes committed. Additionally, student models provide the reasons for this performance, thus, it can adapt the feedback for each one. Consequently, enriching student models with elaborated knowledge of cognitive and affective characteristics of the learner leads to effective tailored instruction customized feedback and intrinsic motivation.

Thus, an adaptive learning system can be operationally defined as an interactive e-learning environment where the content of the modules is tailored or adapted according to students' preferred learning styles. The major goal of the adaptive environment is to direct students to personalised learning pathways that best suit their preferences. This online environment provides continuous support and feedback until reaching the target skills.

Given such features highlighted above, adaptive learning system offers an environment that provides instant recommendations and immediate support and feedback whether for or from learners. Thus, the learner can get scaffolding and notification, alter or substitute activities, and even exchange the

lessons sequence and flow. Consequently, the instructor creates adaptive learning experiences and modulates content sequences in the lesson to steer learners toward proficiency. Such environment can be used to improve English as a foreign language (EFL) listening comprehension skill as one of the most demanding language skills and a skill that poses great challenges for a large number of EFL students for its high fleeting nature. Although EFL Listening is an essential skill to communicate effectively and success academically, it is challenging to both teachers and learners in a traditional learning environment, in which listening is viewed as a passive skill.

Listening for a foreign language is believed by many linguists as the skill that makes the heaviest processing demands on learners. This is because students must store information at the same time as they are working to understand it, which often requires 'split-second comprehension followed by an expectation of a meaningful response'. This on-line processing, as Attia & Mohammed (2019) explain, is mostly daunting for FL listeners due to the highly fleeting nature of the message, the limitation of the memory and the lack of control over the message itself since listeners are at the mercy of the speakers. Listeners have almost no control over what, how and how quickly is going to be said. This forces listeners to process the message immediately, whether they are prepared to receive the information or they are still processing what they have just heard.

In the same vein, listening comprehension has a great impact on learning because students always listen to instructors, peers, and lectures. In most cases, EFL learners encounter obstacles while listening, as they have to practice simultaneous activities while listening such as taking notes, figuring out visuals and figurative expressions, and responding to questions, which in turn causes stress and anxiety. Listening comprehension inaptitude returns to lack of language proficiency, excessive reliance on bottom-up technique and inadequacy of maintaining attention to the listening material (Rahimirad & Moini, 2015).

To emphasize the peculiar nature of listening, Alavi & Janbaz (2014), Chang & Millett (2016), and Chang & Renandya (2018) accentuated that pre-listening supports (namely question preview and topic preparation), extended listening-focused activities after reading, and extensive listening practice improve EFL listening comprehension especially for the students who lack the ability to assimilate auditory materials adequately. They revealed that when the learners listen to the exact audio many times after and while reading its transcript, the result is activating background knowledge, making inferences about some new vocabularies, and

improving listening comprehension; a schema theory-based interpretation of the process of listening in the EFL classroom. Yıldırım & Yıldırım (2016) added to this indicating that EFL teachers can improve EFL listening comprehension if they follow a well-developed format of a listening lesson to include three stages: pre-listening, listening, and post-listening. Each stage should address the learners' needs and both bottom-up and top-down activities.

Some learners may experience apprehension in EFL listening emanating from the lack of both EFL cognitive competence and motivation. According to, Oteir, and Aziz, (2017), Saudi EFL learners encounter EFL listening comprehension anxiety due to the inability to focus attention on the listening tasks, disappointment, and isolation. Furthermore, Chow, Chiu, and Wong (2018) examined the correlation between foreign language listening anxiety and language performance, learning strategies and motivation. They found out that the effective use of authentic materials and learning strategies and the endeavor to maximize motivation to learning have a positive impact on reducing EFL listening anxiety. Additionally, a reciprocal effect between foreign language listening anxiety and listening comprehension skills existed; either influence the other; when the motivation to learn increases, the listening skills improved, and consequently, the anxiety decreases. Such results validate the peculiar nature of listening described earlier by Attia & Mohammed (2019).

Given such a high demanding nature, the interactive model of teaching listening comprehension, as suggested in the adaptive learning environment, can be a solution to the problems aroused. In addition, the connectivism theory can be used as the theoretical basis for such adaptation in which the process of personalizing and tailoring learning based on the learners' preferences is emphasized. Adaptive learning can provide a rich and flexible environment for meeting students' different skills and needs (Kop & Hill, 2008).

Believing in such solution, Kostolanyova, & Simonova (2018) , Sfenrianto, et. al (2018) and Wang & Hu (2018) suggested adaptive learning environments where the participants tried to interact with the audio material and start learning, based on their own needs, pace and proficiency. The focus of the models was to develop different aspects of language proficiency such as phonetics, vocabulary, grammar, discourse, prior knowledge, and strategy use conjointly in a way that revitalizes the learning environment and boosts learners' confidence. It was found out

that personalizing materials in an adaptive learning environment enhances English language learning process to a considerable degree.

Other adaptive environments that utilized learning style preferences as basis of adaptation and worth mentioning are those of Popescu (2010); Yang, Hwang & Yang (2013) and Drissi & Amirat (2016). They confirmed that learning style preferences constitute a valuable adaptation tool for improving individual learning among the user features. Furthermore, they revealed that students' learning style can be considered as significant factor that improves the learning performance in web-based learning or e-learning, achieve high academic results and boost motivation to learn.

The problem of the study

On practical bases, and based on the above review, it can be concluded that the problem of the study has a constructive nature of three dimensions. First, the low scores of students at the College of Science and Art in Qassim University in the listening comprehension skills due to the peculiar nature of the skills described before and its high demands. The researchers' previous background, observation and direct contact with the students in the TEFL skills lab and different course sessions and tests support this claim. Second, the dire need to modify the listening courses provided to students based on the adaptive learning bases to meet students' needs, style preferences and expectations. Finally, the inability of students to deal with the computer skills despite the existence of three computer and phonics labs, provided with the necessary equipment for teaching listening. It was suggested, then, that such problem can be solved by following a different approach in terms of content design, teaching platform and the method of teaching delivery.

The Purpose of the Study:

The purpose of the study is twofold: first, investigating the effect of the proposed electronic adaptive learning environment (EALE) on developing EFL undergraduate students' listening comprehension and e-learning skills. Second, investigating the effect of the learning style preferences of students (surface, deep and strategic) in the EALE on both the listening comprehension and e-learning skills of EFL students in the College of Science and Arts in Qassim University. To achieve this, the following research questions have been proposed:

The questions of the study

1. What is the effect of the EALE on developing EFL students' listening comprehension skills regardless of their learning style preferences?
2. What is the effect of the EALE on EFL students' achievement of the cognitive aspects linked to e-learning skills regardless of their learning style preferences?
3. What is the effect of the EALE on developing EFL students' e-learning skills regardless of their learning style preferences?
4. What is the effect of the learning style preferences (surface, deep and strategic) in the EALE on developing EFL students' listening comprehension skills?
5. What is the effect of the learning style preferences (surface, deep and strategic) in the EALE on developing EFL students' achievement of the cognitive aspects linked to e-learning skills ?
6. What is the effect of the learning style preferences (surface, deep and strategic) in the EALE on developing EFL students' e-learning skills?

Hypotheses:

The present study tested the following hypotheses:

1. There are no statistically significant differences at (0.05) level between the mean scores of students studying the content in an adaptive learning environment regardless of their style preferences in the pre-and-post measurement of the listening comprehension test of EFL students.
2. There are no statistically significant differences at (0.05) level between the mean scores of students studying the content in an adaptive e-learning environment regardless of their style preferences in the pre-and-post administration of the e-learning skills test of EFL students.
3. There are no statistically significant differences at (0.05) level between the mean scores of students studying the content in an adaptive e-learning environment regardless of their style preferences in the pre-and-post administration of the e-learning skills observation form of EFL students.

4. There are no statistically significant differences at (0.05) level between the mean scores of the three groups (surface, deep and strategic) on the post-measurement of the listening comprehension skills test.
5. There are no statistically significant differences at (0.05) level between the mean scores of the three groups (surface, deep and strategic) on the post-measurement of the e-learning skills achievement test.
6. There are no statistically significant differences at (0.05) level between the mean scores of the three groups (surface, deep and strategic) on the post-measurement of the observation form of e-learning skills practical performance.

Participants:

The experiment involved the participation of 58 undergraduate EFL major students at the College of Science and Arts in Uglat Assugour, Qassim University. All students are male due to the segregation policy applied in KSA and they studied English for nine years before enrollment in the university. They also successfully passed an intensive training course in the English language to be allowed for enrollment in the English language and translation department. They were divided into three experimental groups based on their learning style preferences; 27 students in the surface, 19 in the deep and 12 in the strategic.

II. Methodology

Design and procedures

A pre-post experimental groups design was adopted to eliminate the problem of differential influence of any and all extraneous variables; this is done by making the groups similar on any important extraneous variables at the start of the experiment and during the experiment in the present study (Johnson & Christensen, 2000). The following table (Table 1) explains this:

Table (1): Experimental design of the three groups

groups	Treatment		
	Pre-test	Experimental treatment	Post-test
First experimental group	O1	X1	O2
Second experimental group	O1	X2	O2
Third experimental group	O1	X3	O2

The symbols in the above table represents how the study have gone through since Q1 and Q3 for the pre-test and the post-test respectively. As for the experimental treatment, X1 is used for adapted content for students with surface learning style preference; X2 for adapted content for students with deep learning style preference and X3 for adapted content for students with strategic learning style preference;

Moreover, a plan for four weeks was designed by the researchers and was later implemented during the first term of the academic year 2019/2020. The following table (table 2) illustrates the content, the skills and the style preferences:

Table (2): Plan of topics, skills and learning styles distributed by weeks

Week	Topics	skills	Learning style classification	Activities
1	– Life in summer – Signs of the stars	– Making inferences about the meaning of a chunk of text they do not understand – Predicting what they will hear, based on information	Administration of the learning style inventory ASSIST	Learning styles-based Activities
2	– Nature Camp – Homeschooling			
3	– Her dreams – Parenting			
4	– Common			

Week	Topics	skills	Learning style classification	Activities
	<p>Errors</p> <ul style="list-style-type: none"> - Why do people get married 	<p>brought to consciousness and any relevant contextual information ;</p> <ul style="list-style-type: none"> - Solving comprehension problems - Recognizing personal perceptions about text - Linking ideas in the text with other ideas in other texts 		

Procedures:

The procedures of the study can be grouped together to fit three phases; designing the instruments; designing the (EALE), and finally administering the experimental treatment.

First, designing the instruments of the study:

To fulfill the purpose of the study, six instruments were utilized:

1. The EFL listening comprehension skills checklist:

After reviewing literature related to listening comprehension skills for EFL students, a checklist was prepared and presented to nine of TEFL and EFL specialists to identify the most important listening comprehension skills for the target participants. Based on the jurors' opinions, and for achieving the purposes of the study five skills were addressed in the study (see table 2 above).

2. The listening comprehension skills test

A listening comprehension test was designed for two reasons: identifying the level of homogeneity of the three experimental

groups and determining the participants' pre-and post-levels in the EFL listening comprehension skills. The test consisted of twenty-eight listening comprehension questions covering the five listening comprehension skills identified earlier.

The reliability of the listening comprehension test was estimated by getting the coefficient of internal consistency (α Cronbach). 15 students other than the main participants of the experimental groups were selected to be the sample of the pilot study. The value of (α Cronbach) was 0.76 which indicated the reliability of the test.

3. The e-learning skills test

The purpose of the test was to assess the degree to which students' e-learning skills have been developed throughout the study as a result of the frequent use of e-sources in the platform. There have been 17 skills to be investigated. They ranged from recognizing the interface of the platform and the main criteria for preparing the content, up to the process of adding extra content to the content of the study represented in the form of a hyperlink, an interactive video, or create a discussion forum.

4. The self-reflection log.

In order to obtain qualitative data regarding students' confidence and listening development after attending the programme, and to evaluate the programme design and implementation process, an anonymous student "self-reflection" log was utilized. This kind of self-evaluation writings help the researchers to interpret the results more effectively as provide opportunities to participants for sharing their experiences, opinions, and thoughts (Ortlipp, 2008; Shaw, 2010). Within this framework, each student completed four self-reflection forms. These forms were completed during and after the implementation of the programme. The researchers developed the self-reflection forms by taking the literature and necessary data into consideration during the process. Two experts from the field of educational sciences gave their opinions on the form. The data obtained from the forms are used for reinforcing the data gained from the tests.

5. The learning style inventory

The learning style inventory (ASSIST) by Entwistle & McCune (2013) was used to determine students' preferred LS preferences and thus transfer them directly to the associated

content. The inventory is allowed to be used freely with an acknowledgment to the authors. It was administered online through the EALE. In the ASSIST questionnaire, participants were asked a series of 60 questions about their preferences of, or typical engagement with, a range of learning and teaching activities. There are 20 questions (arranged in the analysis into three thematic groups relating to each of deep, surface or strategic learning activities. Upon completion, the students were then divided into three groups; surface, deep and strategic; based on their scores on the inventory. Thus, the environment provided various learning paths tailored according to students' preferences through differentiating the type and level of the activities. Each student proceeded in a personalised learning path working through the activities while interacting with the instructor and peers, receiving appropriate immediate feedback, and dealing with some corrective activities till reaching the mastery level of all the target listening comprehension skills. This will be explained in detail in the next section related to the (EALE).

6. The observation form

The aim of using this was to present how the e-course elements may be useful for the teacher in order to get familiar with the students' activities while performing their tasks and homework exercises electronically. In this way, the teacher can get useful information about each and every student individually, and/or about the whole group of students, about their approach to study, learning intervals, and other relevant data.

Second: Designing the adaptive e-learning environment (EALE) :

EALE presents content that suits the learning preferences of each learner. It is a model that manages the whole process of learning and drives the learners' development based on their learning preferences. This happens through manipulating the learning process and presenting ample feedback. This model consists of two stages:

- a) **Analyzing the learning preferences of learners:** the model analyses the learning preferences of learners in the learning process and saves it in the learner's file. When learners come back, they are provided with the basic information and then receives the adaptive learning content that matches his profile.
- b) **Managing the adaptive content:** in this stage, the learner starts his learning process by receiving the content through

the system which analyses the cognitive process of learners based on the learning preference (surface, deep or strategic) which in turn decreases the cognitive load and presenting on the learner to make the process of learning listening comprehension and electronic learning skills easier. The following figure (1) explains this:

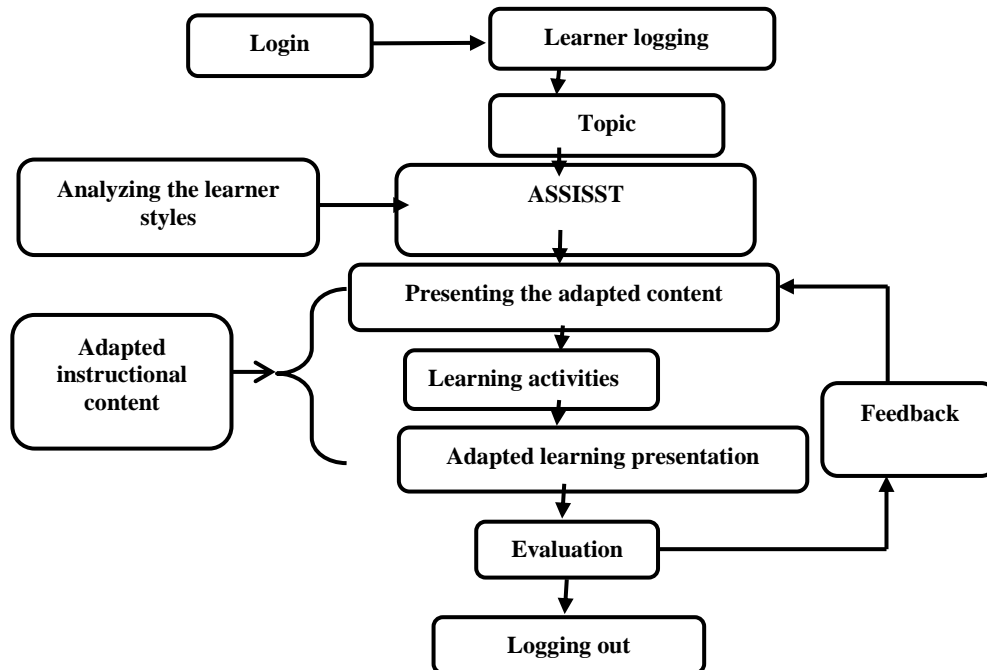


Figure (1): A flowchart for the learner's navigation in the educational content based on his learning preferences

The above figure clearly shows the learner logged into the EALE through the login screen. If his learning style has been analysed earlier, the relevant content is presented to him, directly. If not, it has to be done.

Ruffini's (2002) model of electronic instructional design is the one adopted. It has been embedded through the learning style classification applied. Thus, the following stages, presented in figure (2) have been utilised and applied to design the electronic environment:

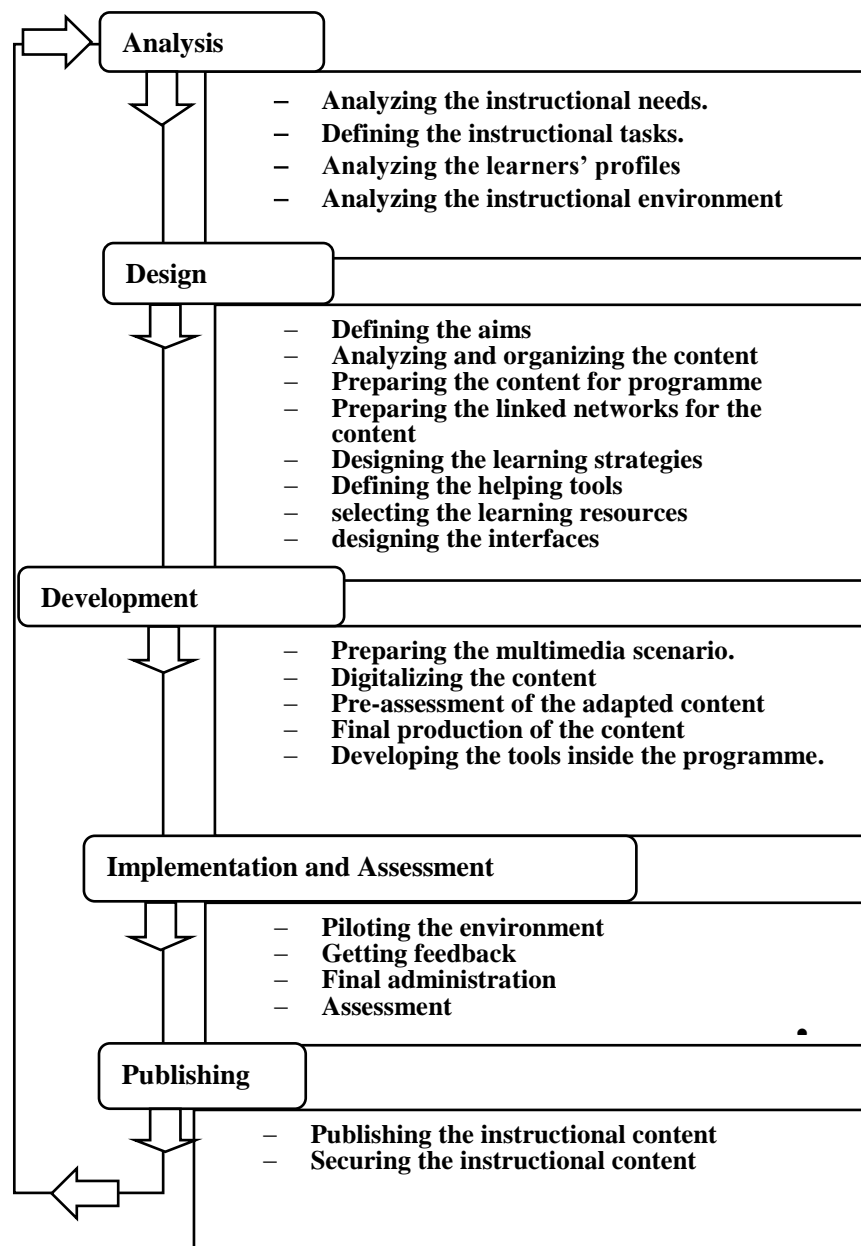


Figure (2): Ruffini model of electronic instructional design (Ruffini, 2002: 12)

Analysis stage:

The instructional goals and tasks of both the listening comprehension and electronic learning have been defined. These skills have been presented to a jury of nine members specialized in EFL education and instructional technology to verify the validity of the analysis. The following table (table: 3) presents the percentage of their agreement:

Table (3): agreement percentage of the jury members of the listening comprehension and electronic learning environment

No.	The skill	Type	Frequency	Agreement percentage
Listening comprehension skills				
١	Recognizing and understanding the word;	Main	8	89 %
٢	Identifying the main and minor ideas;		9	100 %
٣	Linking ideas in the text with ideas outside the text;		8	89 %
٤	Recognizing the self-conceptions around the topic		9	100 %
٥	Deducting the meaning.		9	100 %
Electronic learning skills				
١	Recognizing the interface of the environment	Main	9	100 %
٢	Defining the main criteria for preparing the content		9	100 %
٣	How to create a folder for the content		8	89 %
٤	How to add an element to the content		9	100 %
٥	How to add a file to the content		9	100 %
٦	How to add multimedia files (sound-video- picture)		8	89 %

No.	The skill	Type	Frequency	Agreement percentage
٧	How to add a web-link		8	89 %
٨	How to add a link from you-tube		8	89 %
٩	How to add a link for a file from Slide Share		9	100 %
١٠	How to create an assignment		9	100 %
١١	How to create a test		9	100 %
١٢	How to create a question bank		9	% ١٠٠
١٣	How to create a discussion forum		8	89 %
١٤	Using the advertisement tool		8	89 %
١٥	Using the mail tool		9	% ١٠٠
١٦	How to create a virtual classroom		9	% ١٠٠
١٧	How to manage a virtual classroom		9	% ١٠٠

In addition, the adapted electronic environment that is based on the learning style preference of the learners, have been identified to present the input for the study.

The designing stage:

Several procedures have been applied in this stage to link both the content and learning style preferences in an electronic environment. Following is a detailed description of this:

1. designing the content: three experimental treatments have been designed for the adaptive electronic learning environment (AELE) based on the classification of Entwistle & McCune (2013) to have three types; surface, deep and strategic.
2. designing the concept map to the (AELE) to include both listening comprehension and electronic learning skills based

on the tasks chosen and the aims assigned.

3. designing the navigation style to be non-linear to match the experimental treatments.
4. three scenarios based on the learning styles adopted have been designed. They are validated by three specialists in the field after modifying some parts in the language and arrangement of ideas.
5. designing the interface of the (AELE) which includes the navigation tools and the position of presenting the multimedia.

After registration, the environment asks the learner to answer the questions of the ASSIST to define his learning style preference. After that, the environment shows a screen that includes the adaptive electronic learning content that includes both the listening comprehension and the electronic learning skills. See examples of screenshots to the way the environment is offered to the three groups in the appendix.

After producing the multimedia elements and digitalizing the scenario of the content, an initial part of the content has been piloted to eight students, not included in the final administration, to verify the clarity of the content and its appropriateness to the learners. By doing all the modifications suggested by the jury members, and some of the suggestions aroused by students in terms of clarity and easiness, the (AELE) has been published and secured on the domain: <https://lms.qu.edu.sa/>. An activity log has been used by the manager to monitor the performance of the learners and their development.

Third: The experimentation:

The three experimental groups have been subjected to the three treatment phases of the study. The pre-administration phase occurred at the beginning of the first semester of the academic year 2018/2019. Homogeneity between the three experimental groups was established through the initial administration of the tools of the study to the participants before the final treatment. The results (shown in the results section) revealed that that there is no significant difference between the mean scores of the three groups on the pre-administration of the tests. In other words, the homogeneity was established since the groups are equivalent in their EFL listening and computer skills before applying the experimental treatment.

The proposed (AELE) (the independent variable) was administered to the students of the three experimental groups. It took four weeks for students to finalise the treatment. A training session was conducted to the participants at the beginning to make sure that they possess the required electronic skills for learning through the environment. Besides, the environment gave students the chance to be trained on how to use the available online tools, how to access the content and the linked activities, how to store their work through their profiles on the environment, and how to make use of the available resources associated in a self-based learning manner. The role of the researchers as the administrators of the environment was to monitor students' progress and present feedback to students where necessary.

In the post-administration phase, the final assessment tools were utilised to reveal the changes in students' listening comprehension and the electronic learning skills of the three groups. Data obtained from the tests and inventories have subjected to statistical analysis which would be explained in detail in the following sections.

III. Results and the discussion

The results reached in the current study will be presented based on two dimensions: results related to the effect of the AELE regardless of the learning style, and results related to the effect of AELE associated with different learning styles (superficial/deep/strategic). A discussion of the reasons that might influence obtaining such results will be highlighted after each section for facilitating the process of correlation and relevance. This section ends with a general overview of the results obtained from the self-reflection form and the observation form to substantiate the statistical analysis and the results obtained.

First: Results related to the influence of the AELE regardless of the learning style:

1. AELE and listening comprehension skills:

To investigate the effect of AELE on developing the listening comprehension skills among EFL students, regardless of the learning style preferences, a t-test for two correlated means was calculated between the mean scores of students on the pre-and-post administration of the listening comprehension test.

Table (4): t-test between the mean scores of the pre-and-post measurement of listening comprehension test

test	Mean	N	Std. Deviation	t	df	sig
listening skills pre	12.3793	58	2.30048	25.66	57	0.00
listening skills pos	35.9310	58	6.88212			

In extrapolating the results in table (4) above, it is clear that the value of (t) reached was (25.66) which shows a statistically significant difference at (0.05) level between the mean scores attained by the learners (pre-and-post-test) in the listening comprehension test. Results of the t-test yielded means of (12.37) in the pre-test and (35.93) in the post-test which is significant (sig. = 0.00 = P <0.05) in favour of the post-test score. Consequently, the first hypothesis, stating that there would be no significant differences at (0.05) level between the mean scores of students studying the content in an adaptive learning environment regardless of their style preferences in the pre-and-post measurement of the listening comprehension test of EFL students, was rejected and the alternative one was accepted.

To calculate the effect size of EALE on developing the listening comprehension skills, Eta square equation (η^2) was applied. A large effect size of (0.92) was found for EALE on listening comprehension. Table (5) bellow reveals this:

Table (5): Eta Square (η^2) values for the effect size of EALE on listening comprehension

df	t	Eta squared (η^2)	Effect size
57	25.66	0.92	Large

The results obtained earlier could be attributed to different factors. First; designing an adaptive e-learning environment to develop listening comprehension skills directed towards adapting the process of learning to students' learning styles; encouraged students to address the learning, and achieves skills. The clear, simple, and interactive interface and sequential processes of the environment helped learners get more engaged with the listening content and leaving out all other distorting issues. Student FAS stated this in his own self reflection logs saying: *"The e-environment was free from pressure, monitoring or fear of using technology or committing mistakes, which helped me in overcoming*

the problems of listening. Also, I repeated the material several times which is not available in traditional teaching”.

The above quote reveals that having such a secure environment allowed the learner to develop self-challenge and perseverance to complete the listening tasks provided and master them. In addition, the time limitation was not also an interfering variable. The environment allowed the learners to work freely, based on their abilities, needs and individual differences, utilising the feedback system available. This helped to direct students to their appropriate learning paths.

Second, the content provided was chosen, adapted and represented in the knowledge database (see the methodology section, table 2), through careful analysis of both the nature of the listening comprehension skills and their requirements; and students' needs, abilities and learning speed. Thus, it is presented and processed upon the individual responses of each learner. This pressure-free content participated in allowing students to concentrate more on developing listening skills. In addition, the AELE provided students with different forms of multimedia (visual, auditory, and printed) to integrate both their style preference and the listening tasks and stimulate and challenge their mental abilities through a set of stimuli that addressed the different senses.

Finally, the e-environment was consistent in nature with listening comprehension. It has enabled the process of bilateral communication and dialogue through different means and contributed in allowing for the flow of information in two directions between the content and the learner.

These results are consistent with those reached by Hussani, Nahvi & Ahmadi (2013); Sfenrianto, S., Hartarto, Y. B., Akbar, H., Mukhtar, M., Efriadi, E., & Wahyudi, M. (2018); Kostolanyova, & Simonova (2018) who emphasized on the convenience, feasibility, and practicality of adaptive learning as an approach for teaching different aspects of language learning. On the other hand, Chenoweth and Murday (2003) obtained different results. They explained that blended learning did not yield any significant difference between the two groups of their study on oral production, listening and reading comprehension and grammatical knowledge. The main reason for this was students' inability to handle the electronic feature of the method.

2. AELE and electronic learning skills:

To identify the effect of the AELE on the development of cognitive aspects related to e-learning skills regardless of learning style, the difference between mean scores of students in the pre- and post- measurement of the achievement test was calculated using t-test of two correlated means.

(Table 6): t-test between the mean scores of the pre and post-test measurements of e-earning skills

test	Mean	N	Std. Deviation	t	df	sig
achievement pre	12.8621	58	2.98798			
				27.57	57	0.00
achievement post	35.7069	58	5.53778			

In extrapolating the results in table (6) it is clear that the value of t reached (27.57), which shows a statistically significant difference at the level (0.05) between the of the mean scores attained by the learners (pre and post-test) in the e-learning test. Results of the t-test yielded means of (12.8621) in the pre-test and (35.7069) in the post-test which is significant (sig. = 0.00 = P < 0.05) in favour of the post-test score. Consequently, the second hypothesis, stating that there would be no significant differences at (0.05) level between the mean scores of students studying the content in an adaptive e-learning environment regardless of their style preferences in the pre-and-post administration of e-learning skills test of EFL students, was rejected and the alternative one was accepted.

To calculate the effect size of EALE on developing the cognitive aspects related to the e-learning skills, Eta square equation (η^2) was applied. A large effect size of (0.93) was found for EALE on e-learning knowledge. Table (7) bellow reveals this:

Table (7): Eta Square (η^2) values for the effect size of EALE on the cognitive aspects of e-learning skills

df	t	Eta squared (η^2)	Effect size
57	27.57	0.93	Large

This could be attributed to different factors. First; the ability of adaptive systems to recognise the characteristics of the learners, such as learning styles, learning preferences, experience, and

prior knowledge, as well as the profile of each learner that the content is targeting. This helped to provide students with specific individual content access which permitted to take advantage of the non-linear and personal navigation of the learner by providing learner-specific paths, in a way that takes into account their individual differences. In addition, this assisted in making adjustments in the design and construction of content based on the interaction of the learner with the content, as it adapts to individual differences and different capacities of the learner, and this led to the development of cognitive aspects associated with e-learning skills.

Second, the adaptive e-learning environment provided students with different forms of information and concepts related to e-learning skills, which they did not have before such as copyright, coding, and touch typing. The environment divided the e-learning skills into sequential and interconnected sub-performances, which assisted learners in mastering the development of cognitive aspects associated. In addition, the display method in the adaptive e-environment is characterized by a non-linear pattern, and the diversity of many audiovisual and verbal stimuli that attract the attention of learners; as the increase in the number of senses in learning increases the chances of information to stay in memory.

Finally, the design of the adaptive e-content provided opportunities for the reflective learner to think about information quietly first by presenting information and skills in a logical sequence based on semantic web applications, taking into account their individual abilities, as well as the diversity of their sources across the web, which in turn contributed to the development of listening comprehension skills. Student FAH confirmed this in his reflection log saying “*I had the chance to log into the internet and get the information from different websites to explain the audio material*”. In addition, the learners had the opportunity to think freely about the information that was presented through smart learning systems based on their learning style preferences which helped them comprehend the information provided to them. All these contributed to the development of knowledge aspects associated with e-learning skills.

Holzhüter, Frosch-Wilke & Klein (2013); Amory (2015), and Alotaibi, A. S. (2015), had the same results. They emphasized the usability and usefulness of adaptive e-environment for improving e-learning skills which in turn can improve the process of learning in different domains.

3. AELE and electronic learning skills and the development of the performance aspects of e-learning skills:

To identify the effect of the AELE on the development of the performance aspects of e-learning skills regardless of learning style, the difference between the mean scores of students in the pre- and post- measurements of the e-learning skills observation form was calculated using the t-test for two correlated means. The following table shows these results.

(Table 8) t-test between the mean scores of the pre and post-test measurements of e-learning skills

Test	Mean	N	Std. Deviation	t	df	sig
E-Learning skills pre	15.3966	58	3.13408	45.8	57	0.00
E-Learning skills post	91.8793	58	12.73079			

In extrapolating the results in the table above, it is clear that the value of t reached (45.8), which shows a statistically significant difference at the level (0.05) between the mean scores attained by the learners (pre and post-test) in the e-learning skills test. Results of the t-test yielded means of (15.3966) in the pre-test and (91.879) in the post-test which is significant (sig. = 0.00 = $P < 0.05$) in favour of the post-test score. Consequently, the third hypothesis, stating that there would be no significant differences at (0.05) level between the mean scores of students studying the content in an adaptive e-learning environment regardless of their style preferences in the pre-and-post administration of the e-learning skills test of EFL students, was rejected and the alternative one was accepted.

To calculate the effect size of EALE on developing the performance aspects of e-learning skills, Eta square equation (η^2) was applied. A large effect size of 0.97 was found for EALE on the performance aspects of e-learning skills. Table (9) bellow reveals this:

Table (9): Eta Square (η^2) values for the effect size of EALE on the performance aspects of e-learning skills

df	t	Eta squared (η^2)	Effect size
57	45.8	0.97	Large

This could be attributed to different factors. First, the AELE is based on the principles of connectivism theory by providing communication resources and tools that enable learners to communicate and interact with the teacher and each other. The artificial intelligence modeling model adopted in the design and the interactive interface provided, allowed the learner to freely navigate the content and interact with it, which in turn contributed to the development of the e-learning skills of students of the English Department. Thus; the accurate analysis of the content in the adaptive environment and its representation in the knowledge base with a high degree of accuracy enabled the smart program to identify all aspects of the subject or the field provided and contributed to the development of e-learning skills. Moreover, the content was also well defined and organized according to different learning styles, as each learning style differs in its presentation and activities. Moreover, this included a functional validation to adapt the learning according to its own learning style, through the provision of a content map with coloured boxes that reflect the learners' cognitive status, and added a link to help them understand the basic requirement of the concept under learning.

Second, the self-directed learning strategy applied in the AELE helped in stimulating the learner's motivation for learning and attracting his attention, reviewing and recalling previous knowledge, introducing new concepts and presenting stimuli that correspond to their interests and learning styles. The activities provided encouraged learners to apply theoretical information in practical situations to develop e-learning skills. The diversity of activities within the environment and the interaction of learners with its interface, has helped the learner to transfer the information and skills learned while learning listening. Some other writing skills like editing, publishing, adding and commenting have also been developed through the use of the environment.

Second: results related to the impact of different learning style (superficial/deep/ strategic):

1. The impact of different learning style (superficial/deep/ strategic) and listening comprehension skills:

To identify the difference of learning styles (superficial/deep/ strategic) in the development of listening comprehension skills, means and standard deviations of the three experimental groups were calculated according to the learning styles (superficial/deep/ strategic) as shown in the following table.

(Table 10): Means and Standard Deviations of students' scores on the post-test of listening comprehension based on students' learning styles

Learning style	N	Mean	Std. Deviation
surface	27	31.1111	5.64551
deep	19	36.8947	1.96906
strategic	12	45.2500	3.22279
Total	58	35.9310	6.88212

By extrapolating the results in the table above, it is clear that there were variations in the values of the means. Thus, it was necessary to have deep statistical analysis using a one-way analysis of variance to ensure the significance of the results obtained and its degree. Table (11) shows the results of the analysis of unidirectional variation between the scores of students of the three groups according to the styles of learning (surface /deep/strategic) on the post-measurement of the listening comprehension skills.

(Table 11): Results of unidirectional variance analysis between students' scores by learning styles on the post-measurement of the listening comprehension skills

	Interactive	Sum of Squares	df	Mean Square	F	Sig.
listening comprehension skills post	Between Groups	1687.018	2	843.509	45.811	.000
	Within Groups	1012.706	55	18.413		
	Total	2699.724	57			

It is clear from table (11) that the value of calculated F-Ratio (45.811), is statistically significant at the level (0.05), and this shows that the learning styles in the AELE affected the degree of development of listening comprehension skills. To know the direction of the positive results, the Chevy test was used to make post dimensional comparisons. Table (12) shows a summary of these results:

(Table 12): Results of Chevy test of post dimensional comparisons of students' scores on the listening comprehension test based on their styles differences

Dependent Variable	(I) groups	(J) groups	Mean		
			Difference (I-J)	Std. Error	Sig.
Listening skills post	surface	deep	-5.78363 ^{**}	1.28493	.000
		strategic	-14.13889 ^{**}	1.48874	.000
	deep	surface	5.78363 ^{**}	1.28493	.000
		strategic	-8.35526 ^{**}	1.58225	.000
	strategic	surface	14.13889 ^{**}	1.48874	.000
		deep	8.35526 ^{**}	1.58225	.000

Extrapolating the results in the previous table shows the following:

- There was a statistically significant difference between the mean scores of the first group (superficial learners) and the second group (deep learners), (sig. = 0.00 = P > 0.05) in favour of the group with the higher means; the deep learners, since the value of the difference between the two means was (5.78).
- There was a statistically significant difference between the mean scores of the first group (superficial learners) and the third group (strategic learners), (sig. = 0.00 = P > 0.05) in favour of the group with the higher means; the strategic learners, since the value of the difference between the two means was (14.13).
- There was a statistically significant difference between the mean scores of the second group (deep learners) and the third group (strategic learners), (sig. = 0.00 = P > 0.05) in favour of the group with the higher means; the strategic learners, since the value of the difference between the two means was (8.35).

- With this result, the direction of the differences is in favour of the third group (strategic learning style), thus rejecting the fourth hypothesis, which states that "there are no statistically significant differences at (0.05) level between the mean scores of the three groups on the post-measurement of the listening comprehension skills test, and accepting the alternative one directing the differences towards the third group (strategic learning style).
- This can be attributed to different interpretations. First, designing a mechanism for adaptation according to the learning style, where its efficiency depended largely on guidance, counseling and generating e-dialogue with the content and making different learning decisions. Thus, what can be called a sequential scheme was designed to analyse the learning style of the learner, and then the content was adapted accordingly through the presentation of the content map, based on the relationships between the objectives stored concepts, and the cognitive map of the learner, which in turn contributed to the development of listening comprehension skills. Such a role of information processing for adaptation was effective in managing the adaptive environment to provide the learner with the apt content.
- Second, this result is linked to the selection of information theory, which emphasises the presentation of the educational situation in an overall picture, and the learner selects the part that he wants to learn which helps in the formation of the overall picture through providing some control in the sequence of presentation of the content. The learner had the chance to choose the content that meets his preferences and repeat the different listening activates several times as he wished, and then move forward when recognising the mastering of the listening skills emphasised. This contributed to the survival of learning the skills of listening comprehension.
- On the other hand, students with superficial learning styles tend to be shallow to understand and rely on remembering information. Such students rely on clear instructions, specific curricula, and abstracts without content, and have weak deductive thinking, high levels of anxiety, and impulsivity towards expression, as well as limited in the autonomy of learning and comprehension. This contradicted the above process of an adaptive e-learning environment which led to the superiority of students with a deep and strategic learning

style. Students with a strategic learning style, in specific, are characterized by active and critical interest, linking and organizing ideas, using evidence and logic, which in turn has helped them develop listening comprehension skills.

2. The impact of different learning style (superficial/deep/ strategic) the cognitive aspects related to e-learning skills:

To identify the difference of learning styles (superficial/deep/strategic) in the development of cognitive aspects related to e-learning skills, means and standard deviations of the three groups were calculated according to the learning styles (superficial/deep/strategic) as shown in the following table.

(Table 13): Means and Standard Deviations of students' scores on the post-test of e-learning based on students' learning styles

Learning style	N	Mean	Std. Deviation
surface	27	31.7778	4.50925
deep	19	37.2105	3.10159
strategic	12	42.1667	2.79068
Total	58	35.7069	5.53778

By extrapolating the results in table (13), it is clear that there were variations in the values of the means. Thus, it was necessary to have deep statistical analysis using a one-way analysis of variance to ensure the significance of the results obtained and its degree. Table (14) shows the results of the analysis of unidirectional variation between the scores of students of the three groups according to the styles of learning (surface /deep/strategic) on the post-measurement of the e-learning skills test.

(Table 14): Results of unidirectional variance analysis between students' scores by learning styles on the post-measurement of the e-learning skills test

		Sum of Squares	df	Mean Square	F	Sig.
achievement post	Between Groups	960.526	2	480.263	33.543	.000
	Within Groups	787.491	55	14.318		
	Total	1748.017	57			

It is clear from table (14) that the value of calculated f-ratio (33.543), is statistically significant at the level (0.05), and this shows that the learning styles in the AELE affected the degree of development of e-learning skills. To know the direction of the positive results, the Chevy test was used to make post dimensional comparisons. Table (15) shows a summary of these results:

(Table 15): Results of Chevy test of post dimensional comparisons of students' scores on the e-learning skills test based on their styles differences

Dependent Variable	(I) groups	(J) groups	Mean Difference (I-J)	Std. Error	Sig.
achievement post	surface	deep	-5.43275 ^{**}	1.13308	.000
		strategic	-10.38889 ^{**}	1.31281	.000
	deep	surface	5.43275 ^{**}	1.13308	.000
		strategic	-4.95614 ^{**}	1.39526	.003
	strategic	surface	10.38889 ^{**}	1.31281	.000
		deep	4.95614 ^{**}	1.39526	.003

Extrapolating the results in the previous table shows the following:

- There was a statistically significant difference between the mean scores of the first group (superficial learners) and the second group (deep learners), (sig. = 0.00 = P > 0.05) in favour of the group with the higher means; the deep

- learners, since the value of the difference between the two means was (5.43).
- There was a statistically significant difference between the mean scores of the first group (superficial learners) and the third group (strategic learners), (sig. = 0.00 = $P > 0.05$) in favour of the group with the higher means; the strategic learners, since the value of the difference between the two means was (10.38).
 - There was a statistically significant difference between the mean scores of the second group (deep learners) and the third group (strategic learners), (sig. = 0.00 = $P > 0.05$) in favour of the group with the higher means; the strategic learners, since the value of the difference between the two means was (4.95).
 - With this result, the direction of the differences is in favour of the third group (strategic learning style), thus rejecting the fifth hypothesis, which states that "there are no statistically significant differences at (0.05) level between the mean scores of the three groups on the post-measurement of the e-learning skills test, and accepting the alternative one directing the differences towards the third group (strategic learning style).
 - This can be interpreted from different angles. First, the theoretical basis of learning styles as a set of behavioural and cognitive characteristics represents relatively stable indicators in adapting the learner's perception of the learning environment and their mutual interaction. The adaptation processes, then, becomes responsive to various stimuli to suit the sequence characteristics in a holistic information knowledge associated with e-learning skills.
 - Second, the strategic learning style imposes certain types of interaction, which can be absorbed through the learner's activity in dealing with information, and the mind can deal with several levels or situations at the same time. Moreover, strategic learners are characterised by having organizational skills of mental abilities, time and effort; to obtain high grades in their academic achievement, all within the framework of their external motivation to learn, and not to focus on the task of study. They always try to get some hints and indicators from the teacher in learning situations which help them develop the cognitive aspects of their e-learning skills surpassing the superficial ones.
 - In addition, the diversity of adaptive presentation of content in hypermedia with multiple stimuli, this helped learners with a strategic learning style make correlations and relationships with the different variables, regulate their perception of

information and retaining them in the long-term memory for a long period of time. and remember the cognitive aspects associated with e-learning skills.

3. Learning style differences (superficial, deep and strategic) and the development of the performance aspects of e-learning skills:

To identify the effect of the Learning style differences (superficial, deep and strategic) on the development of the performance aspects of e-learning skills, means and standard deviations of the three groups were calculated according to the learning styles (superficial/deep/ strategic) as shown in the following table.

(Table 16): Means and Standard Deviations of students' scores on the post-measurement of the observation form of e-learning practical skills based on students' learning styles

Learning style	N	Mean	Std. Deviation
surface	27	81.5185	5.65257
deep	19	96.5789	9.35305
strategic	12	107.7500	6.68954
Total	58	91.8793	12.73079

By extrapolating the results in table (16), it is clear that there were variations in the values of the means. Thus, it was necessary to have deep statistical analysis using a one-way analysis of variance to ensure the significance of the results obtained and its degree. The following table shows the results of the analysis of unidirectional variation between the scores of students of the three groups according to the styles of learning (surface /deep/strategic) on the post-measurement of the e-learning practical skills observation form.

(Table 17): unidirectional variation between the three groups according to the styles of learning on the post-e-learning practical skills observation form.

		Sum of Squares	df	Mean Square	F	Sig.
E-Learning skills post	Between Groups	6340.533	2	3170.266	60.175	.000
	Within Groups	2897.622	55	52.684		
	Total	9238.155	57			

It is clear from table (17) that the value of calculated F-Ratio (60.175), is statistically significant at the level (0.05), and this shows that the learning styles in the AELE affected the degree of development of e-learning practical skills. To know the direction of the positive results, the Chey test was used to make post dimensional comparisons. Table (18) shows a summary of these results:

(Table18): Results of Chey test of post dimensional comparisons of students' scores on the e-learning practical skills observation form based on their styles differences

Dependent Variable	(I) groups	(J) groups	Mean Difference (I-J)	Std. Error	Sig.
E-learning skills post	surface	deep	-15.06043 ^{**}	2.17350	.000
		strategic	-26.23148 ^{**}	2.51825	.000
	deep	surface	15.06043 ^{**}	2.17350	.000
		strategic	-11.17105 ^{**}	2.67641	.001
	strategic	surface	26.23148 ^{**}	2.51825	.000
	deep	11.17105 ^{**}	2.67641	.001	

Extrapolating the results in the previous table shows the following:

- There was a statistically significant difference between the mean scores of the first group (superficial learners) and the second group (deep learners), (sig. = 0.00 = P > 0.05) in favour of the group with the higher means; the deep learners, since the value of the difference between the two means was (15.06).

- There was a statistically significant difference between the mean scores of the first group (superficial learners) and the third group (strategic learners), (sig. = 0.00 = $P > 0.05$) in favour of the group with the higher means; the strategic learners, since the value of the difference between the two means was (26.23).
- There was a statistically significant difference between the mean scores of the second group (deep learners) and the third group (strategic learners), (sig. = 0.00 = $P > 0.05$) in favour of the group with the higher means; the strategic learners, since the value of the difference between the two means was (11.17).

With this result, the direction of the differences is in favour of the third group (strategic learning style), thus rejecting the sixth hypothesis, which states that "there are no statistically significant differences at (0.05) level between the mean scores of the three groups on the post-measurement of the e-learning practical skills observation form, and accepting the alternative one directing the differences towards the third group (strategic learning style).

- Different reasons can be identified to interpret the aforementioned results. First, this result is related to the theory of stimuli collection, which depends on the use of visual elements and the associated verbal language in the development of skills that require showing the movement to learn, which is the best mode of displaying the adaptive content to develop the e-learning practical skills by first viewing the animated scenes followed by the fixed scenes and then the verbal elements. Skills like adding a multimedia audio file or a file from slide share that include a presentation of a scene. needs such an animated display of the skill to master it.
- Likewise, this result is related to the process of cognition; as it is a holistic individualistic process, where forms fully impose their presence in the learner's cognition before the perception of parts, and this was demonstrated by the superiority of strategic learners in the development of e-learning skills. Moreover, the growth in the cognitive achievement of e-learning skills is also linked to that, where the development of the cognitive aspect has improved the skills performance of learners.
- Second, developing content modeling, including interrelated content and the tasks related to e-learning skills, helped

learners with a strategic learning style develop their skills better than learners with a deep and superficial learning style. Such students are characterized by their ability and desire to search for the tacit meaning of content, to understand how to perform a certain practical e-learning skill, utilizing their learning methods with both understanding and processes, as well as their ability to relate new ideas to previous experiences.

- Finally, the presentation of skills under the strategic learning approach helped to recognize the relationships between all elements of adaptive content (auditory, or e-learning), and this was demonstrated by arranging and linking sub-skills to reach the performance of the main skill. Students with a strategic learning style have the ability to manage the time allocated to study and make the best use of it, and organize the subjects according to their importance and the required effort. In addition, they have the desire to excel and get high rates, which in turn contributed to the development of their e-learning skills.

Third: Students' reflections log

- The participants' opinions and reflections regarding the progress in both listening comprehension and e-learning skills reflected and supported the results obtained earlier. Investigating them through the self-reflection logs enabled the researchers to gain in-depth information and deep dive into the participants' opinions and concerns regarding the AELE and its relationship to listening comprehension and e-learning skills.
- The data analysis revealed that 21 students, around (36%) of the total participants found that AELE made the process of listening more active and attractive, reinforced critical thinking, and improved challenges, communication, and motivation. TUR for instance said in one of his self-reflection logs "*the interface of the environment was easy to handle and did not cause any trouble to me. It was easy to navigate and get the necessary information required, I worked alone with little help from the doctor*". They felt they are "autonomous learners" which encouraged them to be "more active and independent" as student FAH said. Controversially, 39 % of the participants reported that the traditional method for them is better because "*the aims of the lessons are clear, the content is reachable, and face to face communication is much better*" as student NAYF reported. Moreover, this process needs the learner to be "more skillful in computer which poses more

pressure on us" (learners) as reported by student 22; *"listening has a special feature which needs to be guided by the teacher and I think face to face communication is better for me"* reported by student YOUS.

- However, 64% of the participants (No. 37) reported that their e-learning skills have been developed due to the use of the activities in the programme. Skills such as "adding a hyperlink from slide share, creating a virtual classroom, adding a multimedia file, navigating the websites for adding an educational content and other skills are co-linked to the listening comprehension process. In addition, they gained some e-learning concepts that they did not encounter before such copyright and coding. The researchers' observation during the administration of the study supported this development to a great extent.

IV. Conclusion

With the expanded popular access to information and knowledge anywhere, anytime, the role of education, perhaps especially formal education, is denounced and the relationships between education, society, and technology are now more dynamic than ever. With e-learning environments breaking social strata barriers all over the world, the time has come to embrace the new avenues in educational pedagogy in the form of e-learning and learning adaptation.

The researchers' observations, after initial apprehensions, are very positive, and the process of interactivity with the listening texts is supportive and encouraging. Even the drawbacks mentioned by some students can be sorted out with the help of the state-of-the-art tools for synchronous (like chat, VOIP, audio-video streams and video conferencing) and asynchronous such as (emails and forums) communication. Thus, the process of adaptive learning in an e-learning environment is supportive and productive for foreign language learners and can be fully accelerated if the designers of the environment utilized the massive potentials and sources available on the platforms.

Finally, it is believed that with the frequent application of the combination of pedagogical insights and modern technologies, it is possible to realize successful listening comprehension courses. As a result, future researchers can explore other adaptive presentation methods in the design of hypermedia educational content to improve different language aspects. In addition, research on how to design adaptive e-learning environments

according to artificial intelligence systems to understand and analyze learners' responses is highly recommended. Finally, using the findings of the current study to explore more variables associated with the design patterns of adaptive e-learning environments is also recommended.

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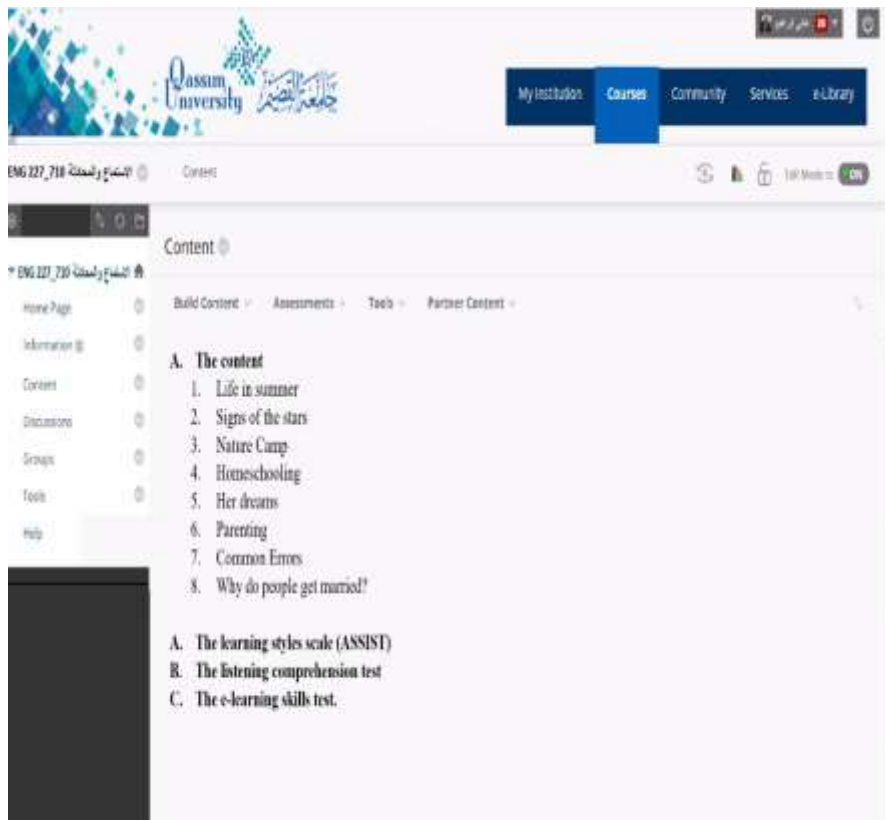
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Appendix




Screenshots to some screens of the EALE presented to the groups of the study



Designing an electronic adaptive learning environment and its effect on developing listening comprehension and e-learning skills among EFL majors

Dr. Hany I. Musa & dr. Sayed S.Abel-Aliem

The screenshot shows a web-based learning environment. At the top, there is a navigation bar with 'My Institution', 'Courses', 'Community', 'Services', and 'e-Library'. Below this, the course title 'ENG 227_718' is visible. The main content area is titled 'Lesson 3: Nature camp (G SI)'. It contains three numbered tasks, each starting with a headphones icon and a question:

1. After listening the text provided, the following activity suggested to students based on the style preferences:

- Describe what did the girl do in the garden?
.....
2. Listen again the text and answer the following question:

- Write two details about the Campowner garden
.....
3. After listening to the text:

- What do you think of the girl's behavior to leave the group and prefer to be on his own?
.....

Qassim University
جامعة القصيم

My Institution Courses Community Services e-Library

EM6 227_733 المحتوى والمعلمة Content

Content


EM6 227_733 المحتوى والمعلمة

Home Page Information Content Discussions Groups Tools Help

Build Content Assessments Tools Partner Content

Lesson 3: Nature camp (G S2)


I. After listening the text provided, the following activity suggested to students based on the style preferences:



- What do you think the girl is going to do based on the questions above?

.....


- Listen again the text and answer the following question:



- The campwood garden is the best area for the girl to do her painting because:

.....

- After listening to the text:



- In your opinion, do you think the girl will do the something if she goes in another camp?

.....

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