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Interaction Between Mobile Applications Based On Spaced Learning Types And Cognitive Style

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Abstract

Chemistry from subjects based on the cumulative construction of information. The study is aimed to develop the retention of learning among second-grade students in chemistry using mobile application based on spaced learning types (electronic-physical) and cognitive style (Leveling -sharpening). The number of participants 68 students divided between 22 (girls) and 46 (boys) between the ages of (16-17) years in a governmental language school in Egypt. The study is conducted to answer the following questions; what is the effect of Interaction between Mobile Application based on Spaced Learning types and Cognitive Style to improve retention in Chemistry for Secondary School Student? The research adopted a number of tools, achievement test (pre-post-follow up) testing consisting of (46) question and proposed program, a list of concepts for chemistry and a cognitive style scale. The results showed that the statistically significant difference at the function levels are (0.01), (0.05) between the average grades of students of the four experimental groups and post-test and follow up test. The magnitude of the impact showed that the effect of interaction between mobile application based on spaced learning types and cognitive style came in favor of the experimental groups as follows (electronic – sharpening) followed by experimental (physical - Leveling) followed by (physical -sharpening) and came experimental (electronic – Leveling) the least in the statistical function teams. The results can be explained and returned that to dividing the period into three sessions for a session of 20 minutes with a 10-minute break and diversity in the presentation of breaks between (electronic- physical).

Keywords: mobile application – spaced learning – cognitive style – retention -chemistry -secondary students**.**

1. Introduction:

The world has become a small village due to the vast and rapid technological progress in all aspects of social, cultural, scientific, and economic life and since education is an integral part of the cultures of peoples, education has been greatly influenced by the modern technological revolution, where there has been a great breakthrough in modern teaching methods and ways ofproviding the teaching content to learners, and there has been a great diversity in modern technological tools with the emergence of interest also in the nature of learners and them sensory and cognitive style and individual differences between students.

With the continued development in the field of mobile technology and the introduction of the third generation of mobile telecommunications technology, the mobile device has become a multi-functions device (Ali & Arshad, 2016, p.1109). In today's world, people not only on a desktop or laptop, but also a mobile device and these mobile devices can connect to download, upload and/or work online via wireless networks, mobile phone networksor both (Hashemi, et al., 2011; Vinu et al., 2011). Until 2018, the numbers of mobile applications have raised to nearly four million applications in Google Play Store or two millionin Apple´s App Store. A new mechanism for training and learning known as mobile learning or m-learning has also appeared (Statista, 2018**).** According to, mobile learning can be used to overcome many educational problems (Ali, Arshad ,2016, p.1109). The Definition of Mobile Learning, the delivery of learning to students anytime and anywhere using wireless internet and mobile devices, including mobile phones, Tablet.

There is a widespread ownership of mobile technology, including mobile/ smartphones, tablets, Chromebook, among school-aged youth (Bedesem & Arner, 2019). Also defined as "learning across multiple contexts, through social and content interactions, using personal electronic devices" (eg, smartphone, PDA, tablet), affords learning opportunities beyond the traditional methods used in classrooms, such as the ability to extend the learning space from a formal context (classroom) to an informal context (social network, augmented reality, location awareness) (Crompton, 2013, p.4). The rapid growth of mobile technologies has provided learners with great opportunities to learn inside as well as outside the classrooms (Sung, Chang, & Liu, 2016, p.252). Mobile learning uses IR when accessing the internet anywhere at any time, M-learning, MMS, and SMS messages are used to exchange information between users, mobile learning, Bluetooth and IR technologies are used to exchange books andfiles among, mobile learning provides users with more protection as learners use their own devices to connect with others (Awad,2014). Mobile technologies provide numerous opportunities to support learning and can be used both inside and outside the classroom (Özdener & Demirci, 2018, p.3).

Recently, mobile technologies have been considered as a wider educational application that can provide users with personalized information, adaptive assistance, and instant social interaction platforms (Sharples, 2015; Song & Kong, 2017, p.32). Using a mobile application was more need satisfying and intrinsically motivating than using a textbook, which, in turn, predicted higher levels of well-being and achievement (Jeno, Adachi, Grytnes, Vandvik & Deci, 2019, P.680). Mobile application (versus textbook) may also allow students to identify species morequickly and accurately, which are important benefits for work field that often has time-constraints (Jeno et al.,2019, p. 680). The benefit of spaced repetition on learning has been recognized for over a century, with Ebbinghaus

(1885) made the first systematic investigation of memory, developing a 'forgetting curve (Voice1 & Stirton,2020, p. 1). Spaced repetition is a learning technique based on reviewing of the knowledge in increasing time intervals. It is designed to help the student memorize a large amount of small independent pieces of knowledge with the following goals in mind: Maximize the amount of remembered information, Minimize learning time **(**Keder, 2009, p. 4).Experiments conducted by Hermann Ebbinghaus showed that the process of forgetting as shown in the following figure (Keder, 2009,p.4).

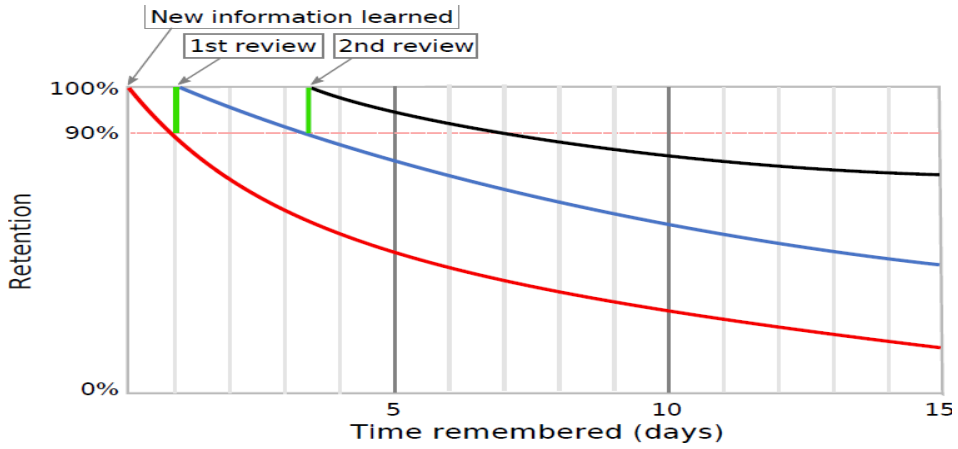


Figure (1) shows

Illustration of a forgetting curve (Keder,2009, p. 6)

Researchers have found that spacing has a positive impact on learning new material and reviewing learned material. For example, found that one spaced review significantly increased meaningful learning and retention after 48 hours in learning the endocrinology of pubescence **(**Ausubel & Youssef,2010, p. 147–150**).** learning includes long intervals between learning sessions is termed spaced learning (Smolen**,** Zhang & Byrne, 2016, P.77). Such learning has been known since the semifinal work of Ebbinghaus (1913) to be superior to learning that includes short inter-trial intervals (massed training or massed learning) in terms of its ability to promote memory formation. Ebbinghaus stated: "with any considerable number of repetitions asuitable distribution of them over a space of time is decidedly more advantageous than the massing of them at a single time".

In education long term memory is needed for students to have a sound platform of understanding on which to build new advanced knowledge, and to apply when solving- problems. Indeed, the Benchmark Statements for Physics **(**Quality Assurance Agency, 2017) and Chemistry (Quality Assurance Agency, 2014) specifically mention this skill (Voice1, & Stirton, 2020). It is important to note, however, that emphasizing effort can backfire if students do not use effective learning strategies **(**Dweck, 2015**)**. The principle of spaced learning is supported by evidence from two scientific fields, neuroscience, and cognitive psychology. The neuroscience literature supports the use of shorter spaces between learning (of around ten minutes), and the cognitive psychology literature supports longer spaces (of around 24 hours) (O'Hare et al.,2017, p. 4).

In this research (Spaced Learning: The Design, Feasibility and Optimizations of SMART Spaces). SMARTS was proved that the Spaces programmer is version (3): (10-minute and 24-hour spaces) but in my study the researcher will use version one (10-minute spaces) because this version is appropriate for the nature of the Egyptian curriculum.

A survey of 189 science undergraduates revealed that students in all years' study predominantly by reading and writingnotes during term time, with 69% leaving any form of self-testing until the month before the exam **(**Curtis et al., 2018).In STEM classroom situations recent studies have demonstrated the benefit of spaced repetition on long term memory with students (Kerfoot et al., 2007,p.23), Math's students (Rohrer & Taylor, 2007, p. 481-498**);** (Gallo & Odu, 2009, p. 299-325); (Rohrer, 2009**,** p. 4-17), (Hopkins et al., 2015 p. 853-873), **(**Kapler et al., 2015, p.38-45). Spaced learning is using the psychological spacing effect. The spacing effect is known since the19th century, but it could be conveniently utilized only with the advent of information technology. The reason is that the "administrative" tasks of the learning process could be done by a computer, thus liberating the student of this burden. It also enabled using of more complexalgorithms, because they are no longer computed manually **(**Keder, 2009, p3). The most well- known probably being Anki and Duolingo (Voice1 & Stirton, 2020, p.2**).** For instance, computers can be easily programmed to keep track of a learner's performance and control the sequencing of items to make sure that unknown or hard items are studied more frequently than known or easy items (e.g., van Bussel, 1994; Nakata, 2008; Pyc & Rawson, 2007, 2009; Siegel & Misselt, 1984). However, students were reluctant to use the app and reported low enjoyment (Hanson& Brown, 2019, P.1).

Only recently, however, has the spacing effect been studied in the context of categorization and generalization tasks **(**Birnbaum et al., 2013; Kang & Pashler, 2012; Kornell & Bjork, 2008; Kornell, Castel, Eich, & Bjork, 2010; Rohrer, 2012; Vlach et al., 2008; Vlach, Ankowski, & Sandhofer, 2012; Wahlheim, Dunlosky, & Jacoby, 2011**).**To date, in research on spaced learning schedules in categorization and generalization tasks, learners have been presented with exemplars of a given category with an equal, or roughly equal, temporal separation between successive exemplars (Vlach, Catherine, Sandhofer, & Bjork,2014,

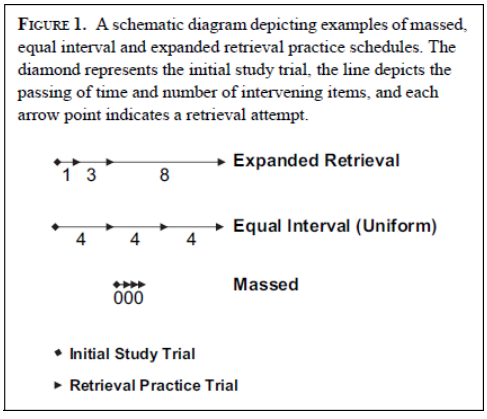


FIGURE 1. A schematic diagram depicting examples of massed, equal interval and expanded retrieval practice schedules. The diamond represents the initial study trial, the line depicts the passing of time and number of intervening items, and each arrow point indicates a retrieval attempt.

Figure (2) shows the different between spaced learning and massed learning **(**Logan&Balota,2008, pp.258**)**

Subjects were given a final cued recall test (John).Results from Experiment 1 showed that, during both phases of the experiment, memory for items presented in the expanded condition was superior to those presented in the uniform spacing condition, yielding an average 15% increase in performance during the first phase and an 8% increase in the final testphase **(**Logan&Balota,2008, p.258).

2. Physically spaced learning type:

Is a teaching methodology useful to quickly seize information in long-term memory based on a particular arrangement of the lesson time that comprises three input sessions and two intervals **(Fields, 2005)**. In the first input session, the teacher provides information that students need to learn during the lesson. It is important to present the essential information in a technical language that characterizes the subject to be treated. The input length is not predetermined, although retaining students' attention for more than 10–15 minutes is notoriously difficult. In this session, the neural pathways begin to create memory. This first session is followed by a 10-minute interval, which must not have any relevance to the content of the lesson**(Garzia, et al.,2016, p.4)**. During this and subsequent interruptions, it is important to avoid stimulating the paths of memory being formed. Therefore, the activity must not have anything to do with what the students are learning, to increase the chances for the neural pathway to have 'rest' and to form stronger connections. Asking students what they would like to do can be a trump card here. In the second input session, the teacher revises the content of the first session, recalling key issues, arousing memories and changing the manner of presenting the content (e.g., using a variety of examples that are characterized by high interactivity level). The stimulation will affect the same neural pathways as the first input, informing the brain of their importance **(Garzia, et al.,2016, p.4)**. In the second interval, the same principles as the first are applied, leaving a rest/relaxation period of about 10 minutes. In this pause, the activity can be a variation of the previous one; what matters is that it has no connection with the content of the lesson.

3. Electronic spaced learning

Leveraging spaced learning comes with many benefits, and the steps associated with its implementation for online learning are easy. Ensure you get these steps right while you aim for effective spaced eLearning for your student (Chetia ,2020).

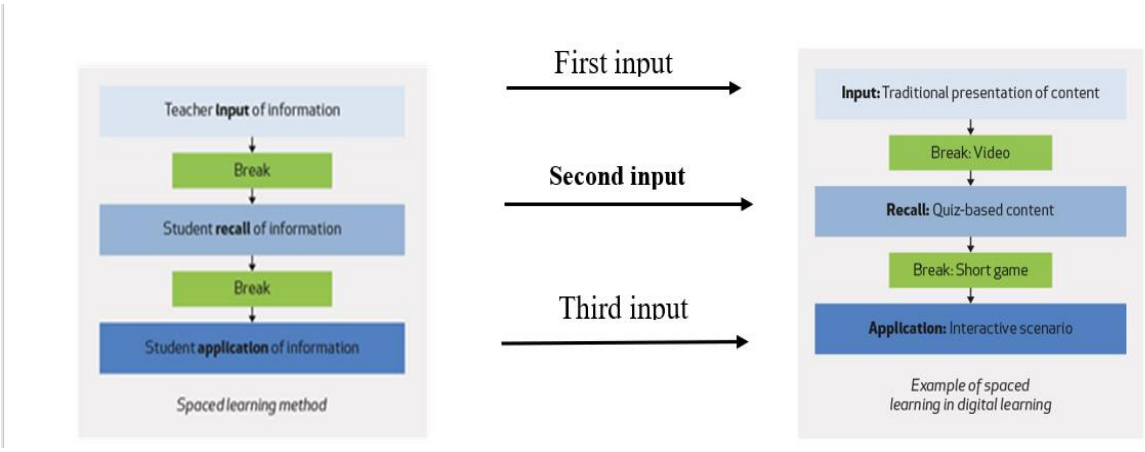


Figure no (3) Example of spaced learning in digital learning (Emsley,2016).

Evidence exists that individuals possess habitual ways of approaching tasks and situations associated with patterns in cognitive processes including decision making, problem-solving, perception, and attention. Such approaches are conceptualized as cognitive style, aconcept first formally introduced by Allport almost eight decades ago (Bendall et al. ,2016, p.1)**.** Learning about students' cognitive style helps teachers to understand their individual differences in different educational situations, particularly in problem -solving positions, allowing the use of teaching strategies that are appropriate to their preparations, as I well as the possibility of predicting their performance in problem -solving positions so, it is necessary for the teacher to learn about the different cognitive style of the students so that he can use appropriate learning strategies with each student and the extent to which these strategiesaffect the educational performance of the student and his achievement ability and in this study the researcher studied the impact of the strategy of learning spaced learning on students Leveling and sharpening and the extent to which the cognitive style is influenced by the educational strategy used functional magnetic resonance imaging.

The cognitive style defined by Barry (2001) the individual differences in ways of gaining, processing, storing, andrecalling information from the memory which is indicated with increased neural conflict adaptation effects in task-relevant brain networks as the preference for a verbal cognitive style increased, suggesting that flexible cognitive control isassociated with an individuals' preference for cognitive style (Shin & Kim, 2015). The researchers in psychology and education fields define learners` cognitive styles as the information processing habits of individual learners. Researchers also found that individuals are different in their ways of seeking and processing information, and cognitive styles serve as relatively stable indicators of how learners perceive and interpret information, and respond to learning environments (Wolfe & Johnson,1995). "Levelers and sharpeners are two ends of visual sensitivity continuum **(**Christian, 1997). Sharpener/Leveling: This dimension describes reliable individual variations in the assimilation of information in memory **(**Christian, 1997, p.45). Leveling versus sharpening – individual variations in remembering that pertain to the distinctiveness of memories and the tendency to merge similar events (https://www.instructionaldesign.org/concepts/cognitive-styles/). This approach assesses how people observe and memories imagery. Levelers are more likely to overlook inconsistencies, make

stories simpler and assimilate information more willingly, but sharpenersare more likely to distinguish between similar images, remember detail and rely more on memory **(**Kaoud,2014, p.9). This methodology evaluates how individuals watch and retain symbolism. Levelers are bound to ignore irregularities, make stories less complex and absorb data even more eagerly, yet sharpeners are bound to recognizecomparative pictures, recollect detail, and depend more on memory **(**Kaoud,2014)**.**

4. Problem statement: -

Since the current research aims to provide the interaction between mobile application based on spaced learning types and cognitive style to improve retention of chemistry it went on thefollowing:

- **Personal experience as a chemistry teacher,** the researcher noticed the weakness of student's inremembering the concepts of chemistry and also linking these concepts and finding logical and correct relationships between them and also noted especially when teaching the unit of the element inchemistry, which speaks mainly on the periodic table and the different characteristics of the elements (physical-chemical) that students suffer from remembering the many numbers contained in the periodic table of numbers of atomic and mass numbers, and the resulting different characteristics of the elements and also the students lack in understanding of the relationships that are created by the student The order of the elements within the table and we find mainly due to the abundance of information provided in this unitthat the student cannot organize this information properly within his memory and also finds it difficult to call this amount of information and not link these relationships.
- Support for the results of the exploratory study carried out by the researcher after the completion of the study of the unit of the modern periodic table and its characteristics for 2020-2021, which aimed to know the reasons for the low grades of students in the unit, the results of which were as follows:
    a. 70% of students referred to the method of presentation of the curriculum as it does not take intoaccount the individual differences between students, while 80% of students reported that a largeamount of information is provided within the class, 75% of students forget the shortly after studying and 70% of students confirmed that they suffer from the distinction between the different concepts of the periodic table unit and 75% of students indicated thatno sessions were allocated to review the scientific subject
    b. More than 90% of students suffer from reviewing the information were already studied the testsWhich makes them review a large amount of information in a short time.

All these factors led toa lack of collection of the subject and their feeling of difficulty in studying the material and the burden in studying it with their ability to easily recall information during the performance of tests, these results were supported with the previous studies in the teaching problems related to the fruitfulness aspects were that the prospective teacher didnot provide the new conceptions that guided the inquiry on the wider fields **(**Redhana et al.,2017).

Chemistry didactics -up to now- has been sheltered in the practice of educational models that seem to be efficient but that encases several difficulties in knowledge dissemination. This is due primarily to the

lack of clear comprehension-explanation mechanisms for those theories that are being reproduced (Obaya, 2019, p.25254). A spectrum of obstacles is then built, especially when ways or organizing scientific rationality for knowledge dissemination are concerned (Obaya & Delgadillo, 2001).Many conferences and studies addressed the difficulties faced by teaching the subject of the chemistry at the 20th International Conference on Chemistry Education held in the Republic of Mauritius, I put forward many working papers that address the obstacles facing teaching chemistry globally, and the indicatorsof this Many students are reluctant to study chemistry and the low motivation and enthusiasm ofteachers to teach chemistry The existence of a conceptual mix among students about many concepts of chemistry and the decline of the trend towards specialized scientific readings and many studies indicated the decrease in the popularity of the study of chemistry in the secondary school.

5. Research Questions:

The research is an attempted to answer one major question:

What is the effect of Interaction between Mobile Application based on Spaced Learning typesand Cognitive Style to improve retention in Chemistry for Secondary School Student?

This major question, in turn, comprises subsidiary questions as follows:

1. What is the proposed educational design of Mobile application based on Spaced learning types to improve retention in Chemistry for Secondary School Student?
2. What's the effect of Spaced learning types (Electronic– Physical) via apps of M-learning in improving student retention in chemistry for secondary school student?
3. What's the effect of cognitive style (Leveling-Sharpening) in improving student retention in chemistry for secondary school student?
4. What is the effect of Interaction between Mobile Application based on Spaced Learning types and Cognitive Style to improve retention in Chemistry for Secondary School Student?

6. Research objectives:

This research aimed at the following which were divided into two types:

- **General aim:** To examine the effect of Interaction between Mobile Application based on Spaced Learning types and Cognitive Style to improve retention in Chemistry for Secondary School Students
- **Specific aims:**

1. The proposed educational design of Mobile application based on spaced learning types to improve retention in chemistry for secondary school Student
2. The effect of Spaced learning types (Electronic– physical) Via apps of M-learning in improving student achievement and learning retention in chemistry for secondary school student.
3. The effect of cognitive style (Leveling-Sharpening) in improving student achievement and learning retention in chemistry for secondary school student.

4. Limit the proposed educational design of Mobile application based on Spaced learningtypes.
5. Reached the Design standards of M-application based on Spaced learning types and improve retention in chemistry for secondary school student.
6. The proposed vision of a strategy Spaced learning via apps of M-learning.
7. Technological skills do high school students have to use mobile learning applications.

7. Research Significance:

The prospective results of the current research are hopefully expected to help:

- For Ministry of Education, providing models of mobile applications that can be emulated to develop other similar applications that consider students'
- learning methods and preferences in mobile educational applications to work on achieving other goals for chemistry.
- Contribute to providing Arabic literature with a theoretical background for Mobil learning based on spaced learning types.
- For mobile app designers, draw their attention to the Spaced learning types that is commensurate with the method of cognitive learners considering the results of thestudy, so that they are considered when designing applications.
- For the students, developing student achievement and keeping students informed as muchas possible using mobile apps because it prolongs their attention as well as their learning enjoyment.

The research was delimited to the students of second grade secondary of CairoGovernmental Language School in Egypt in the first semester of the academic year (2021/2022) on Chemistry Curriculum “Chapter Two: The Periodic Table and classification of elements”

8. Research sample

Participants were (68) students of second year of secondary school in Moai experimental Language School in Cairo. Recalling scale for the cognitive style on the first semester. In this test, the examinee is shown 15 pages with geometric designs, one at a time, for (5) seconds each. After viewing each stimulus design, the examinee is asked to know the different between shapes from memory in the response booklet. The range of recall total score is (0) to (15) seconds. A person who scoredabove (8) was sharpening, and who scored below (7) was Leveling. The (17) most Leveling students and the (17) most sharpening students were identified and assigned at random to two classes of second secondary school taught at the same time of the day based on (17) levelers and (17) sharpeners per class. Present researcher had expressed a preference for Spaced learning (electronic) strategy (experimental group) In one class. The present researcher had expressed a

preference for a spaced learning(physical)strategy (experimental group) In the same class.

9. Research instruments

The research instruments consisted of:

- Cognitive Style (Leveling Vs. Sharpening) (prepared by the researcher).
- Achievement test on chemistry on (pre-post) the classroom interaction system.
- Learning retention measurement test (follow up-test)

10. Research variables:

- Independent variable:
  - Spaced Learning (Electronic – Physical)
  - Cognitive Style (Leveling vs- Sharpening)
- Dependent variable: Learning retention

11. Research Hypotheses

1. There is no statistically difference at the level of significance (0.05) between the mean scores of students studied using an electronic type and students who studied using a physical type in the post application of the achievement test due to the impact of the different types of spaced learning.
2. There is no statistically difference at the level of (0.05) between mean scores of students with cognitive style (Leveling) and students with cognitive style (sharpening) in the post application of the achievement test due to the impact of different learning methods.
3. There are no statistically significant differences between the mean scores of students of the four experimental groups (electronic leveling type/leveling physical type/electronic sharpening type /physical type of sharpening) in the post application of the attainment test due to the effect of the interaction between the type of spaced learning and the cognitive style.
4. There is no statistically difference at the level of significance (0.05) between the mean scores of students studied using an electronic type and those with a cognitive (Leveling) style in the post-test and follow up applications of the achievement test"
5. There is no statistically difference at the level of significance (0.05) between the average grades of students studied using a physical type and those with a cognitive (Leveling) style in the post-test and follow up applications of the achievement test.
6. There is no statistically difference at the level of indication (0.05) between the average grades of students studied using an electronic type and those with a cognitive style (sharpening) in the post-test and follow up applications of the achievement test.
7. There is no statistically difference at the level of indication (0.05) between the average grades of

students studied using a physical style and those with a cognitive style (sharpening) in the post-test and follow up applications of the achievement test.

12. Research methodology

The research employed a descriptive analysis and quasi-experimental method. The descriptiveanalysis is used to analyse the studies related to the variables of the research. It included the literature review and studies conducted on improvingthe retention of chemistry.

The research employed a (2X2) factorial design with spaced learning strategies (Electronic – physical) as one variable and cognitive style (Leveling vs. Sharpening) as the other. The quantitative analysis of the data allowed the researcher to make comparison between the scores of the four experimental groups on pre-posttest. Additionally, the quantitative analysis ofreconnaissance sample.

13. Research design

Considering the independent variable of the research and the classification variable, theresearcher used the experimental design known as Factorial design 2*2. Therefore, the researcher implemented pre/ post-test to 4 groups as shown in the table (1).

Table (1): Experimental Design 2*2

Variables		**Groups**			
Spaced Learning (Electronic - Physical) breaks	**Pre-test Achievement test**	**Group (1)** Spaced learning (electronic) + Leveling	**Group (2)** Spaced learning (physical) +Leveling	**Post-test Achievement test**	**Follow up-test Achievement test**
Cognitive style (mental ability) (Leveling-Sharpening)		**Group (3)** Spaced learning (electronic)+ sharpening	**Group (4)** Spaced learning (physical) + sharpening		

The research procedures were the following:

1. Reviewing the literature related to mobile application based on spaced learning types and cognitive style to improve retention in chemistry. The researcher surveyed the literature review related to the research variables; mobile application based on spaced learning, cognitive style, and retention.
2. Designing the list of concepts (chapter 2 in the curriculum of chemistry of second secondary students) and judge the list of concepts.
3. Preparing study tools, including:

- Designing the achievement test by the table of specifications then calculating the Validity and reliability for the achievement test by the application of the test on a random sample (15 students).
- Designing the cognitive style scale then Calculate the validity and reliability for the application of the scale on a random sample (15 students).

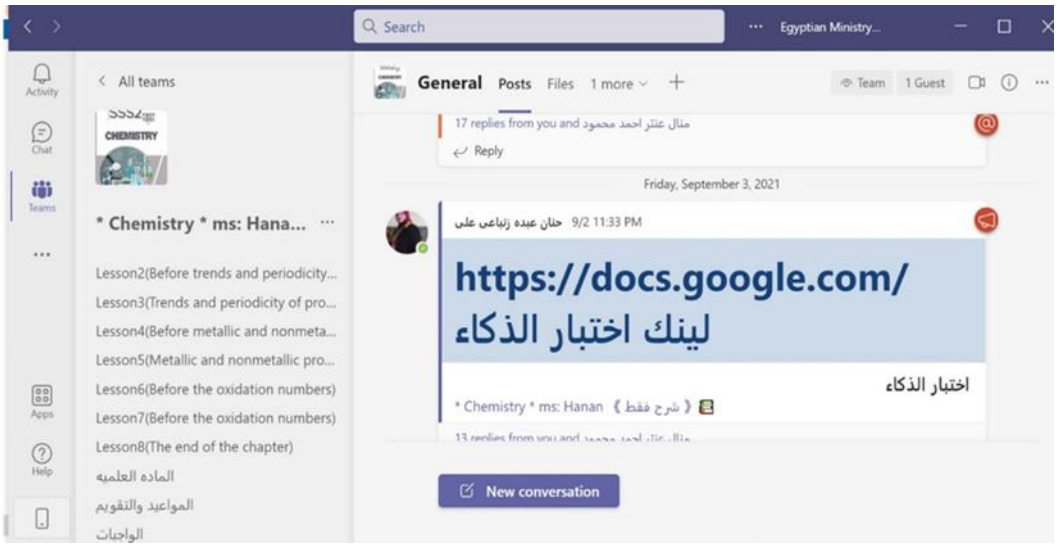
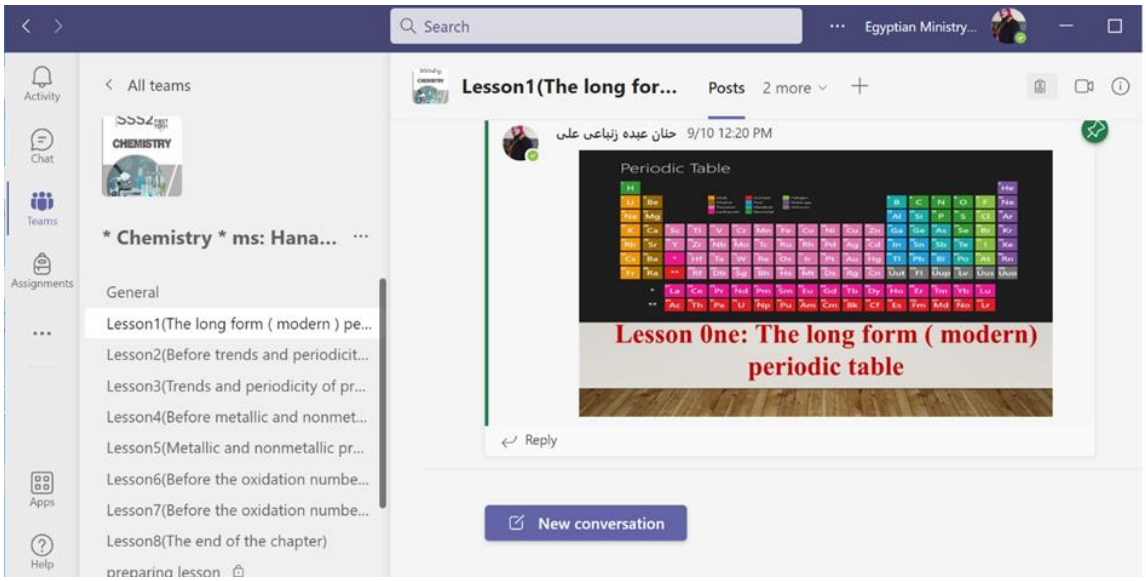


Figure no (4): The cognitive style scale inside platform

4. Designing the electronic environment using Teams platform. It represented the technical part of the research, So the curriculum is designed according to the types of spaced learning (electronic – physical).



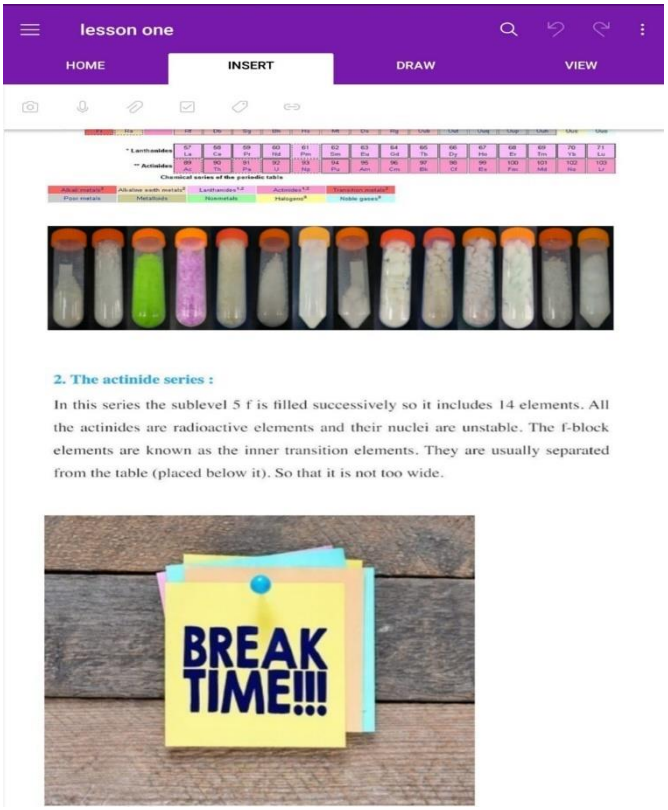


Figure no (5): Designed the electronic environment inside Teams platform

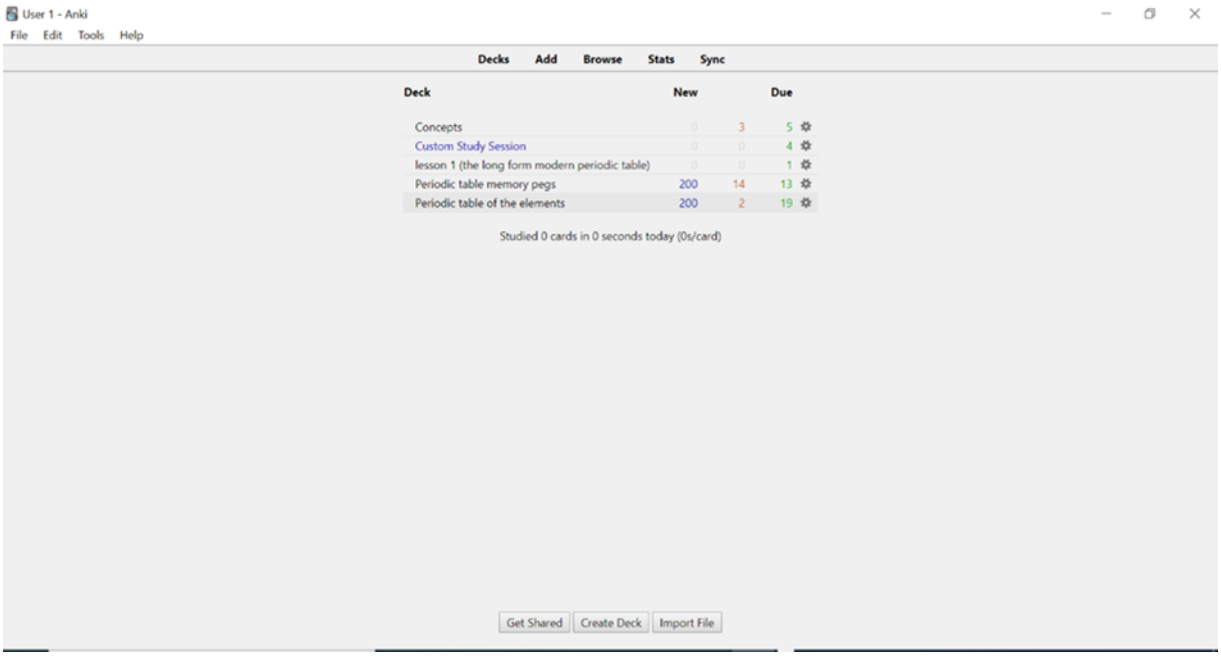


Figure no (6) : Using Anki application in feedback

5. Classification the student according to the cognitive style by using the recalling scale and

conducting the pre-test to four experimental groups.

6. Meeting with students to explain the strategy and the steps used in implementing the educational strategy and explain the application used in the implementation of the strategy and how to deal with it and how to access the educational platform and how to deal with it.

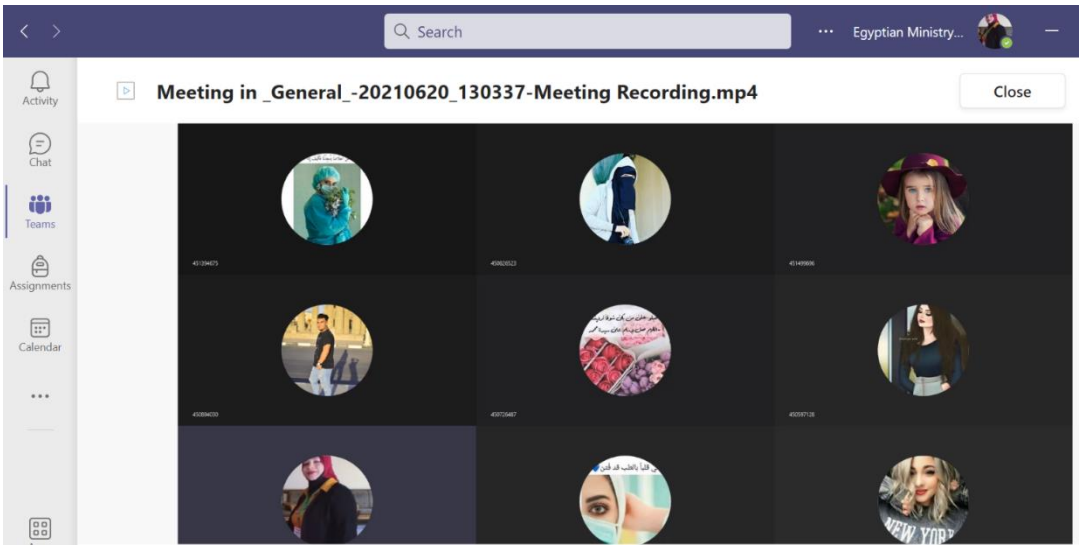


Fig no (7): synchronous session with students

7. Conducting the treatment on the experimental groups.
8. Conducting the post-test to the four groups.
9. Conducting the follow up test to the four groups.
10. Analysing results.

The results indicated that the use of the pattern of electronic breaks with students of the levelling to reduce their educational achievement and the retention with them and this can be attributed to (1) that the students of the levelling have less mental capacity and difficulty in remembering information and organizing information within working memory and when using electronic breaks (electronic game - video) with students of levelling led to a dispersion of students and not allowing memory to take mental comfort allows the student the opportunity to organize information and the memory was uploaded video clips And events of an electronic game that negatively affected the students of the levelling

But when using the physical breaks with the students of the levelling led to better results as the breaks based on simple mathematical movement or simple manual work (such as making shapes with clay or cutting and sticking papers) within the classroom did not affect the students of the levelling in the organization of information and in improving the efficiency of the long-term memory of students and did not cause them dispersion and also the student's distance from devices and visual distractions such as watching a video or electronic game worked to improve the results of the students levelling and this It came in

agreement with the study ,(Kaoud,2014).

14. Conclusion

The results of the research came to confirm the importance of mobile learning based on the strategy of spaced learning in two types. The use of the pattern of electronic breaks with students of the cognitive style sharpening came with better results than the use of the physical pattern of breaks. Also, the use of the physical pattern of breaks with students of the levelling.

15. **Discussion and Recommendations.**

Considering the results, the research recommends:

1-Encouraging teachers to use different learning in the same style (electronic- physical) in the development of students' skills and knowledge - for different educational stages

2-Training students to use mobile learning based on a spaced learning strategy that is different in all student courses .

3-Use the list of concepts reached for the modern periodic table in chemistry to provide content analysis and provide different environments based on mobile and distance learning.

4-Training students and teachers in using electronic programs to produce flash cards of all kinds and employ them in an appropriate way in learning that is far apart in different types of breaks in different courses.

5- Training designers in designing electronic environments based on mobile learning and spaced learning that are different in styles considering the appropriate educational design.

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