



**Port Said University**



**Faculty of Education  
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**An adaptive electronic program based on learning styles to  
develop functional skills and Meta cognitive Thinking of  
Geography Section Students at Port Said  
Faculty of Education**

**A Thesis Submitted in Partial Fulfillment of the Requirements  
for the Award of Degree PH.D By researcher**

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**Research Title:**An adaptive electronic program based on learning styles to develop functional skills and Meta cognitive Thinking of Geography Section Students at Port Said Faculty of Education

**Abstract:**The problem of the research was the presence of a weakness in functional skills and the level of metacognitive thinking among student teachers in the Geography Section at the Faculty of Education. Therefore, the researcher designed an adaptive electronic program based on learning styles to develop functional skills and metacognitive thinking among students of the Geography Section in the Faculty of Education.

The aim of the research was to reveal the effectiveness of the program was used, and the descriptive approach, the experimental approach with a quasi-experimental design, and the systemic development approach were used. The research tools included a list of functional skills, a list of dimensions of metacognitive thinking, an adaptive electronic program scenario based on learning styles, a student teacher's book, a teacher's guide, and VARK questionnaire to determine the learning style, The functional skills test, the functional skills note card, and the metacognitive thinking test.

The research sample consisted of (30) male and female student teachers in the Geography Section. The results of the research resulted in the effectiveness of the adaptive electronic program based on learning styles to develop functional skills and metacognitive thinking among students of the Geography Section at the Faculty of Education in Port Said, and thus the primary goal of the research was achieved.

The research recommended that the necessity of use adaptive learning programs when training students of Faculty of education on functional skills in geography. The need to train students of the Faculty of Education on the skills of using technology and the Internet in teaching, and the need to pay attention to develop metacognitive thinking.

### Introduction

Functional skills in geography include many mental and practical skills that help the student teacher to better practice his life roles, whether his role as a teacher or learner or in work and production situations or as a person who has family roles and multiple social relationships. Cassidy classifies the skills that students acquire during their lives. Study into technical and non-technical skills; the first means precise knowledge and competence in a specific subject or content, and the second; these are skills that can be considered relevant to many different jobs and professions.

The importance of metacognitive thinking lies in enabling learners to develop an action plan in their minds for a period of time, then contemplate it, and evaluate it upon completion. It also facilitates the process of making provisional judgments, comparing and evaluating the learner's readiness to undertake other activities, makes the learner more aware of his actions, and empowers learners. It monitors plans during their implementation and makes the necessary corrections. It works to develop the learner's ability in the process of self-evaluation, which is one of the higher mental processes that he performs with the aim of improving performance. It also contributes to developing the performance of low-performing learners, by unleashing their latent thinking.

The transition to adaptive learning represents an opportunity to provide flexible learning programs, which paves the way for a sustainable shift towards more online learning in this sub-sector in the future. Adaptive learning is directed by the teacher or trainer in the learning paths with the aim of improving the learning process by taking into account differences. Individualization among students, allocating learning content for each student, and minimizing comparison of the student's performance with other students, as the comparison centers on his level of self-development.

Adaptive learning includes educational electronic programs that modify the method of displaying content in smart ways according to the user's needs. Those in the educational field consider it a revolution in education in this era, and adaptive learning systems provide effective materials and activities for students and teachers to improve the level of learning compared to traditional styles, as it provides a new educational experience based on students' previous knowledge and tendencies.

To confirm the sense of the problem, the researcher applied a observation card for functional skills to (30) students from the Geography Department in the third and fourth year, as well as a measure of metacognitive thinking. Their results revealed the presence of weakness in functional skills among student teachers.

While the results of applying the metacognitive thinking scale revealed a weakness in aspects of metacognitive thinking at a rate of 80% among (25) students out of (30) students from the third and fourth years of the Geography Department at the Faculty of Education.

Based on the above, the problem of the current research is: a weak level of functional skills and a weak level of metacognitive thinking among student teachers of geography. Therefore, the current research sought to measure the effectiveness of the adaptive electronic program based on learning styles in developing functional skills and metacognitive thinking among student teachers, Section Geography at the Faculty of Education.

**The current research seeks to answer the following main question:**

Q: What is the effectiveness of the adaptive electronic program based on learning styles to develop functional skills and meta-cognitive thinking among the students of the Geography Section of the Faculty of Education? The following sub-questions branch out from the main question:

- 1- What functional skills are appropriate to develop among third and fourth year students in the Geography Section at the Faculty of Education?
- 2- To what extent are student teachers in the Geography Section in the third and fourth years at the Faculty of Education able to master functional skills?
- 3- What are the appropriate dimensions of metacognitive thinking to be developed for the third and fourth year students of Geography Section at the Faculty of Education?
- 4- To what extent are students in the third and fourth years of the Geography Department at the Faculty of Education able to understand the dimensions related to metacognitive thinking?
- 5- What is the educational design of the adaptive electronic program according to VARK's sensory learning styles (Visual -Aural- Write/Read- Kinesthetic/performance) to develop functional skills and metacognitive thinking among students in the third and fourth year, Geography Section, Faculty of Education?
- 6- What is the effectiveness of the adaptive electronic program based on learning styles for the development of functional skills among the third and fourth year students of the Geography Section at the Faculty of Education?
- 7- What is the effectiveness of the adaptive electronic program based on learning styles to develop meta-cognitive thinking among the third and fourth year students of the Geography Section at the Faculty of Education?
- 8- What is the impact of Learning paths in the adaptive electronic program according to VARK's sensory learning styles (Visual -Aural- Write/Read- Kinesthetic/ performance) on developing the functional skills of students who are geography teachers at the Faculty of Education?
- 9- What is the impact of Learning paths in the adaptive electronic program according to VARK's sensory learning styles (Visual -Aural- Write/Read- Kinesthetic/ performance) on developing metacognitive thinking among students who are geography teachers at the Faculty of Education?

**Research objectives: The current research aims to:**

- 1- Providing a list of functional skills appropriate for development among students who teach geography at Faculty of education.

- 2- Providing a list of criteria for designing an adaptive electronic program according to VARK's sensory learning styles (Visual-Aural- Write/Read- Kinesthetic).
- 3- Providing a list of metacognitive thinking skills appropriate for development among students who teach geography in colleges of education.
- 4- Providing a university teacher's guide for implementing the adaptive electronic program according to VARK's sensory learning styles (Visual-Aural- Write/Read- Kinesthetic/performance).
- 5- Measuring the effectiveness of the adaptive electronic program based on learning styles to develop functional skills among students of the third and fourth year of the Geography Section of the Faculty of Education.
- 6- Measuring the effectiveness of the adaptive electronic program based on learning styles to develop meta-cognitive thinking among third and fourth year students of the Geography Section of the Faculty of Education.
- 7- Exposing the impact of the adaptive electronic program based on learning patterns according to sensory learning styles (Visual-Aural- Write/Read- Kinesthetic/ performance) on the development of functional skills.
- 8- Detecting the impact of the adaptive electronic program based on learning styles according to sensory learning styles (Visual-Aural- Write/Read- Kinesthetic/ performance) on the development of metacognitive thinking.

### **Research importance:**

- 1- With regard to the Ministry of Education: This research may contribute to giving features to those concerned with the Ministry of Education to enable the use of information processing technology and its applications to develop educational and educational processes.
- 2- With regard to educational program designers: It may provide program designers, implementers, developers, and beneficiaries with modern technologies, as it contributes to paying attention to individual differences among learners, and benefiting from tests designed to measure functional skills and metacognitive thinking in similar studies.
- 3- Concerning student teachers: This research may contribute to adopting clear decisions regarding the educational practices of student teachers in colleges of education and provide techniques that contribute to providing them with cognitive and practical skills and in accordance with modern trends in teaching student teachers in accordance with international standards, and providing a university teacher's guide for implementing the program. Adaptive electronic learning according to the sensory learning styles of the VARK model (Visual-Aural- Write/Read- Kinesthetic/ performance).
- 4- With regard to faculty members, teachers, and supervisors: It may provide them with new suggested methods that will help them diversify their teaching. It will also help supervisors refer to it when needed when directing their learning and training during service, and benefit secondary school teachers in evaluating the extent of their possession of job skills in light of the skills test.

5- With regard to researchers and graduate students: This research may contribute to opening horizons for researchers to conduct independent studies related to developing other skills using different educational techniques.

**Research limits: The current research was limited to the following limits:**

**1- Objective Boundaries:**

- Functional skills appropriate to be developed among students of the third and fourth year of the Geography Section of the Faculty of Education, which were identified in (the skill of effective communication - the skill of using technology in teaching geography - the skill of geographical research - the skill of teamwork - the skill of taking responsibility for learning - the skill of self-efficacy in geographical work).
- meta-cognitive thinking among students of the third and fourth year of the Geography Section at the Faculty of Education, which were defined in (planning - monitoring and self-regulation - knowledge evaluation).
- The adaptive electronic program according to the sensory learning styles of VARK (Visual-Aural- Write/Read- Kinesthetic/performance).

**2- Time limits: The application took place in the academic year 2022/2023.**

**3- Spatial boundaries: Faculty of Education, Port Said University.**

**Research community:** The research community consists of student teachers in the Geography Department of the Faculty of Education, Port Said University. The research sample includes students of the third and fourth year of the Geography Department.

**Research Methodology:**

- 1- Descriptive approach:** In some stages of this research, through reviewing educational literature and previous studies related to the research variables, as well as in building research tools.
- 2- The systemic development approach:** By presenting a proposed model for designing the adaptive electronic program in light of the Muhammad AttiaKhamis model and the Dick and Carey model and in accordance with VARK's sensory learning styles (Visual -Aural- Write/Read- Kinesthetic/ performance) and based on pre-determined foundations and goals and in light of A list of criteria for designing and developing the program in light of it.
- 3- Experimental method Quasi-experimental design:** To measure the effectiveness of the electronic program, a one-group design was used using pre- and post-measurement.

**Research hypotheses:**

- 1- There is a statistically significant difference between the mean scores of the experimental group students in the pre and post applications of the functional skills test in favor of the post application.
- 2- There is a statistically significant difference between the mean scores of the experimental group students in the pre and post applications of the functional skills observation card in favor of the post application.

- 3- There is a statistically significant difference between the average scores of the experimental group students in the pre- and post-applications of the metacognitive thinking test in favor of the post-application.
- 4- There is no statistically significant difference between the mean scores of the students according to the sensory learning styles (Visual-Aural- Write/Read- Kinesthetic/performance) in the post-measurement of the functional skills test.
- 5- There is no statistically significant difference between the mean scores of the students according to the VARK sensory learning styles (Visual-Aural- Write/Read- Kinesthetic/performance) in the post-measurement of the functional skills observation card.
- 6- There is no statistically significant difference between the average scores of students according to VARK sensory learning styles (Visual-Aural- Write/Read- Kinesthetic/performance) in the post-measurement of the metacognitive thinking test.

### **Search procedures**

1. Review previous Arab and foreign literature and studies in the field of developing functional skills and metacognitive thinking.
2. Preparing a list of functional skills and a list of metacognitive thinking.
3. Preparing electronic educational content for the selected topics in the form of content that suits the learning styles identified according to the VARK model of sensory learning styles.
4. Review previous studies and research that designed programs based on adaptive learning systems; In light of learning styles; To benefit from it in designing the program content in light of functional skills, a list of which was prepared, and metacognitive thinking, a list of whose dimensions was prepared.
5. Choosing the design model proposed by the researcher according to the W.Dick and Carey models and the Muhammad AttiyaKhamis model, applying its steps, and preparing a list of program design criteria.
6. Producing the program in its initial form and testing it on an exploratory sample of the research community, presenting it to the arbitrators, and modifying it in light of their opinions, and in light of the list of design criteria for the program.
7. Preparing the program in its final form Amending the lists in light of the arbitrators' opinions and finalizing them.
8. Amending the lists in light of the arbitrators' opinions and finalizing them.
9. Preparing the functional skills test, the metacognitive thinking test, and the functional skills observation card, presenting them to the arbitrators, amending them in light of their opinions, and putting them in their final form.
10. Applying the tools to a survey sample to calculate validity and reliability.
11. Choosing the research sample: students from the experimental group.
12. Apply the tests and observation cards beforehand.
13. Drawing conclusions and processing them statistically.

14. Program application: Adaptive electronic program based on learning styles.
15. Applying the tools remotely to the students of the experimental group.
16. Extracting the results of the functional skills test, the metacognitive thinking test, and the functional skills observation card, processing them statistically and interpreting them in light of the results of the four patterns.
17. Providing a set of recommendations and proposals in light of the results of the experimental study.

**Search terms:**

**First: Learning styles:**

Procedural definition: Accordingly, the researcher defines learning styles as: “the preferred and relatively stable sensory styles and entrances used by the student, the geography teacher, which represent a strength point for every learner in the collection, perception, storage and retrieval of knowledge in a functional way, and it includes according to the VARK model: (Visual learning style- Aural learning style - reading / writing learning style-kinesthetic learning style), and are expressed in the answers preferred by the student in the VARK learning styles test.

**Second: Adaptive learning system:**

The researcher defines it as: “Customizing a group of unique electronic educational links designed according to the content of functional skills and the dimensions of metacognitive thinking and according to the learning styles model of the VARK model; by re-editing and changing the presentation of the content within them, according to the style and pattern of each learner, and designing them based on first testing the learner to know His learning style: It guides students and geography teachers to find the appropriate educational content for their learning style, as well as providing the appropriate educational material for each student, with the aim of developing their functional skills and metacognitive thinking.

**Third: Functional skills:**

**The procedural definition of functional skills:**

They are a set of mental and motor performances acquired through an adaptive electronic program based on learning patterns in a planned and systematic manner. They help the student who is a geography teacher to benefit from his studies, help him adapt to the work program, and enhance his personal and teaching competence in the field of teaching geography. These skills include:

- 1- **Effective communication skill:** This means the transmission of written or oral information, symbols, signs, and images between the student, the geography teacher, and his students and colleagues in a good manner, and his sharing and exchange of information in a smooth and clear manner that ensures the achievement of learning goals.
- 2- **The use of technology in teaching geography:** This means that the student, the geography teacher, and using of technological technologies well in teaching and learning geography, and it includes the use of the following programs (arc gis, mobile topographer) and the use of some Google services in Self-research and development.



3- **Geographical research skill:** It means the activity carried out by the student, the geography teacher, while dealing with geographical material with understanding and knowledge, efficiently and easily, with the aim of collecting, recording, organizing, displaying and interpreting geographical information, the student/the geography teacher, used the knowledge bank and the Google engine for geographical research purposes.

4- **Teamwork skill and taking responsibility for learning:**

**Teamwork skill:** It means cooperation between students and geography teachers in building an effective work team, using their individual and group skills and providing constructive feedback, practicing leadership and negotiation skills, and actively participating in group decision-making; while **Responsible learning skill:** It means Activities that direct the thinking of the geography teacher student to manage his learning, achieve his academic and teaching goals, and employ his experiences and teaching skills in the educational process.

5- **Self-efficacy in geographical work:** It means the student's geography teacher's self-esteem with regard to his expectation of his ability to accomplish the work and plans that he sets for himself and his ability to balance between the skills and capabilities that he possesses to achieve the desired goals of teaching the subject and carrying out tasks Successful completion of the academy required of him.

**Fourth: meta-cognitive thinking:**

**The procedural definition of meta-cognitive thinking:** These are the capabilities that enable the student, the geography teacher, to continue his learning, through the adaptive electronic program based on learning styles, and the practice of planning, organizing, and evaluation procedures, While processing geographical knowledge, it is expressed by the total score that the student teacher obtains from the metacognitive thinking test.

1- **Planning:** It is a mental process concerned with determining the nature of the task, and depends on the use of careful analysis, with the aim of making the appropriate decision about implementing a certain behavior in the future, while developing a vision of what developments and developments may occur during work, and using appropriate styles of dealing.

2- **Monitoring and self-regulation:** This means controlling and adjusting the requirements for completing the task and comes as a result of the student/geography teacher's awareness of how to control the center of his attention for all the requirements of the scientific task and link the requirements to perform it accurately and direct himself towards achieving the goal.

3- **Assessment Knowledge:** It means an activity that accurately measures the extent to which the required goals and objectives are achieved and establishes an advantage, importance, judgment, or value for certain things as a result of approaching certain evidence with established criteria to reach that judgment.

**Research Results :** The results of the research showed that there were statistically significant differences between the average scores of the experimental group students in

the pre- and post-applications of the functional skills test, the metacognitive thinking test, and the functional skills observation card in favor of the post-application. Which proves the effectiveness of the adaptive electronic program based on learning styles in developing functional skills and metacognitive thinking among the geography teacher students in the research sample.

**Research recommendations: In light of the research results, the researcher recommends the following:**

- 1- The importance of those in charge of preparing the geography teacher for the development of functional skills and meta-cognitive thinking among students.
- 2- Providing curriculum planners and developers with research results that have proven the effectiveness of the adaptive electronic program based on learning styles, so that they can develop curricula and teaching styles in light of the theory of learning styles to meet the needs of learners.
- 3- Training geography teachers before and during service on functional skills, which have become a societal requirement to meet the needs of the labor market; So that they can train their students on it during the teaching process.
- 4- The need to pay attention to improving the quality of educational programs and training students for lifelong and continuing education.
- 5- A country that possesses high-quality education and distinguished graduates can conquer the labor market and is certain to achieve prosperity and economic progress. This achieves community prosperity and sustainable development. There is a strong direct relationship between education and the prosperity and progress of society.

**Research proposals: In light of the research results, the researcher proposes the following:**

- 1- The necessity of training Faculty of Education students on the skills of dealing with computers and the Internet in the age of technology.
- 2- Faculty of education use adaptive electronic programs to teach students instead of traditional education.
- 3- Preparing students in Faculty of education to deal with adaptive electronic programs in studying various courses.
- 4- Training faculty members on how to prepare their courses to suit adaptive learning programs.
- 5- The necessity of using synchronous and asynchronous interaction tools via the Internet in teaching students, in addition to face-to-face interactions that increase students' motivation towards learning.
- 6- The importance of practical training to provide students with practical skills, as they are sometimes not suitable for learning in an e-learning program via the Internet.
- 7- The need to combine modern electronic programs with traditional styles of education to obtain the greatest effectiveness of the educational process.
- 8- The necessity of paying attention to the dimensions of metacognitive thinking and

## *Summary of the Study*

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integrating them into the programs and courses of study for students of the Geography Department in particular, and students of the Faculty of Education in general, Because it is one of the basic skills that the student needs, starting from the stage of planning tasks and geographic information, and ending with the stage of evaluating knowledge, These skills are classified as lifelong learning skills.