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Effectiveness of Learner Control and Program Control Strategies in Developing Mathematical Thinking for Slow Learners in Mathematics

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The current study aims at identifying the effectiveness of learner control and program control strategies in developing slow learners' mathematical thinking in mathematics. The sample of the study consisted of a group of slow learners (120) in mathematics at Alkharj intermediate schools. The 120 students were equally divided into three groups: 40 students for the first experimental group (learner control), 40 students for the second experimental group (program control), and 40 students for the control group. The study revealed that there are statistically significant differences between the mean scores of the first experimental group (learner control) and the control one in the mathematical thinking test favouring the first experimental group. It also revealed that there are statistically significant differences between the mean scores of the second experimental group (program control) and the control one in the mathematical thinking test favouring the second experimental group. Furthermore, the study results showed that there are no statistically significant differences between the mean scores of the first experimental group (learner control) and the second experimental group (program control) in the mathematical thinking test. Due to the study results, it is recommended that using computers should be integrated in designing slow learners' mathematics curriculums. The study also recommends that mathematic teachers should design and use computer programs in teaching slow learners. Finally, the study recommends preparing teachers to deal with slow learners using computer programs, taking into consideration the role of the teacher as the core of the learning process and not relying only on computers in the learning process.

Key words: *Learner control, Program control, Mathematical thinking, Slow learners.*

Introduction

The present age is marked by rapid and various changes that are caused by a scientific revolution. The educational systems in this age of science help learners face future challenges with the help of theories and methodologies. Interestingly, many educational theories advocate learner's autonomy, especially with the increasing use of educational computer programs (Beckers, 2019; Blanton, et al 2017; Dawkins & Weber, 2017). The computer is one of the main features of the scientific and technological revolution in education, which has been adopted by some teachers to design lessons or courses such as science and mathematics using computer programs. While using educational computer programs in the learning process, the learner's control, according to these theories, does not happen immediately or abruptly, but slowly at various stages of the learning process. The learners need to take several tests during this process. Past studies have sought to find a balance between the number of tests a learner sits for and the highest scores he /she can get when using a computer in the learning process.

There are various advantages of using computers in the educational process. It allows the learner to accelerate according to his/her efforts through a simplified subject matter. It also gives the learner the opportunity to process that subject matter and test and upgrade him/her to the next level. Moreover, using computers allows each learner to learn according to his or her capabilities and knowledge. Finally, computers can be used among big and small groups (Alhila,2001:455). There are varied ranges of educational control broadly classified as the learner control and the program control. Giving the learner the full control of the educational process is known as learner control, while the control by the program is known as program control. There are various factors required to determine the choice of appropriate control, such as anticipating the effect of such a control on the outcomes of the educational process (Abdul-Majeed, 2006:50).

In the context of the current study, one of the most important educational processes, or the type of thinking is Mathematical thinking. Mathematical thinking is defined as a flexible and organised cognitive activity which aims to solve mathematical problems using the following thinking skills according to the nature of each problem: induction, education, using symbols, realising relationships and mathematical proof. Mathematical thinking is calculated by the total score the student gets in the mathematical thinking test. Exponentially, mathematical thinking increases the learner's ability to understand mathematics as well as a few other subjects, of which comparative reviews helps to understand and promote students' power of mathematical thinking (Downton & Sullivan, 2017; Goos, & Kaya, 2020). The importance of Mathematical thinking, in fact, stems from helping the learner to solve mathematical exercises and problems through deduction, introspection, realising relationships among the problem variables, and using symbols for mathematical concepts. When a learner acquires an appropriate mathematical thinking style, it remains all his/her life. Additionally, the mathematical proof enables learners to understand daily life problems and thus enables them to realise learning and make it meaningful. Furthermore, it is considered a way to perceive the symbolic power that helps learners perceive learning patterns and organise them mentally and symbolically in order to acquire them (Turner, 1997: 66-72).

The second variable of this study was the problem of slow learners. As pupils differ from each other physically, mentally, emotionally and socially, it has been estimated that there can be 20 slow learners among each 100 pupils (Sadek1982:11). Slow learners have several characteristics: their intelligence quotient (IQ) ranges between (70-90, below average); they are less motivated towards learning mathematics; they are mentally disabled, which affects their achievements; they have a negative attitude towards themselves and the school; due to low achievement, they have a feeling of shyness, pressure, anxiety and loneliness; and, they are unable to concentrate for more than twenty minutes without changing the educational climate. The problem of slow learners is one of the problems that educationalists counter through identifying the slow learner, instructing him/her or mainstreaming him/her in the school community (Mata-Pereira, & da Ponte, 2017). It is obviously clear that this category of pupils is great, so they shouldn't be neglected. Slow learners also represent an effective educational loss to the society; hence, we should take care of them to avoid such a loss in education.

This study examines the need and importance of identifying appropriate teaching approaches for slow learners to develop their mathematical thinking. The current study stems its importance from proposing a computer program based on learner control and program control strategies which allows learners to address more than one sense, provides various ways of presenting information and moves learners from one success to another. Consequently, the learner will develop his/her learning autonomously and select topics that suit his/her interests and needs (English, & Gainsburg, 2016; Jeannotte, & Kieran, 2017). Additionally, the current study encourages teachers to use a computer program based on learner control and program control strategies to help slow learners acquire proficiency in different school subjects. Moreover, it motivates mathematics teachers to use interesting methods of teaching that fit pupils' levels. Also, it helps educationalists to provide services that help students with special needs, especially slow learners, improve their academic performance. This can be done through suggesting educational and remedial programs that help slow learners develop themselves and train them on the necessary skills they need in their lives.

Problem Statement

It is obviously clear that there are slow learners in mathematics classrooms. Such a category of learners has been neglected despite their great number and this neglect is considered an obstacle to achieving the objectives of the educational process. Consequently, the objectives of teaching mathematics will not be achieved properly. This means thousands of students take classes but do not get any benefit from them. As they face educational, behavioural and adaptation problems, their academic performances and ability to adapt psychologically and socially get affected adversely. This also creates a gap between educational inputs and outputs (Alrafoo 2004). Apart from slow learners, it has also been observed that a number of students have poor mathematical thinking and are unable to solve mathematical sums and problems. Such slow learners are unable to justify mathematical sums and cannot figure out the solution or build up new mathematical models (Henawi 2008:26).

The most effective strategies highlighted in the previous studies are learner control and program control strategies, as the previous studies showed that using program control provides positive results from the perspective of gaining and reviewing information (Lee & Lee 1999; Morrison 1992; Hooper & Withamsy, 1993; Sayed ,1996). Some studies such as (Milheim 1990; Al-Maghrabi, 1995; Hsin & Brown, 1995; Safaan, 2000; and Yeh & Lehman, 2001) showed the effectiveness of learner control strategy in achievement. On the other hand, some other studies concluded that both strategies can be used at the same time with the same efficiency level and without any difference (Ibrahim, 1999; Amin,2000; and Azmy, 2000).

These studies lead to formulating the following questions for the current study:

1. What is the effectiveness of *program control strategy* in developing slow learners' mathematical thinking in mathematics?
2. What is the effectiveness of *learner control strategy* in developing slow learners' mathematical thinking in mathematics?
3. Which of the two strategies, Learner control/Program control, is more effective in developing mathematical thinking for slow learners in mathematics?

Literature Review

Learner Control vs Program Control (LC)

Learner Control (LC) is defined as enabling the learner to take decisions regarding the time allotted for learning, and to accelerate learning, go forward and backward, repeat the subject matter or exit the program and seek help in case of failing to get the correct answer. Azmy (2000), determines three types of monitoring learner control: autonomously, by tracking and in a sequence, while Amin (2000) adds a fourth dimension of learning content and its reaction. On the other hand, Program Control (PC) is defined as enabling the learner to control only the time allotted for learning within the model controlled by a program designer. Control Structures restrict the program as well as the learner to "take decisions." A program is usually not limited to a linear sequence of instructions, since during its process it may bifurcate, repeat code or bypass sections. Control Structures are the blocks that analyse variables and choose directions in which to go based on given parameters. It is very important to note that it is difficult to control all these factors at the same time by the learner or use them with all learners in all subjects. However, some of these factors should be selected according to the learning objectives and learners' characteristics, motivation, prior knowledge, cognitive styles and efficiency of using what is presented to them. This phenomenon was also observed in a few other studies emphasising programming techniques in learning management systems (Ilyas, Kadzrina & Adnan, 2017; Ilyas, 2017).

Learner control, generally, is the strategy of giving the student the opportunity to be effective in the selection and implementation of both content and teaching approaches related to teaching in the teaching process. In other words, it is the situation where the learners are given a certain level of autonomy in order to manage their own learning experiences themselves. Because; learning is not a passive process of taking, but an active meaning-making process, and it is the learner individual who performs the learning. The general purpose of this research is to determine the level of "Learner Control Strategy'' under certain methods, time duration, implementation and feedback (Milheim and Martin, 1991). The greatest advantage of learner control over traditional forms of education is the potential for students to continue education at their own pace, controlled by their own needs and preferences (Eom and Reiser, 2000). The ability to adjust their own order is a learner characteristic that can affect the ability of the student to benefit from controlled learning (Armstrong, Dupont, & De Wit, 1989; Eom and Reiser, 2000). A student's perception of self-sufficiency can be measured by evaluating his / her abilities and the power of this belief (Bandura & Locke, 2003).

Mathematical Thinking

Mathematical thinking is considered an important component in mathematics curriculums, as it encompasses all the principles the world would know. These principles are included in the mathematics school curriculum and issued by the National Council For Mathematics Teachers (NCTM). Moreover, mathematical thinking is also one of the main objectives of teaching and learning mathematics for all students at all levels. According to (NCTM, 1989), mathematical thinking is not only proof of having mathematical knowledge or a mindset but also it includes a wide range of capabilities that students have to master, such as implementing introspective and inductive thinking; understanding and applying thinking processes, especially spatial thinking; creating mathematical guesses and proofs; making counter examples; holding logical discussions; and making judgments based on true proofs and justifications.

The importance of mathematical thinking as a key higher order learning goal in mathematics education is widely accepted. Pólya (1963, p. 605) wrote: "First and foremost, it [mathematics education] should teach those young people to THINK." In line with this, Skemp (1976), convincingly argued that one should teach for relational rather than instrumental understanding. NTCM (1989, p. 31), highlighted the power of mathematical thinking and described some key elements: "[…] mathematics offers distinctive modes of thought which are both versatile and powerful, including modelling, abstraction, optimisation, logical analysis, inference from data, and use of symbols." More recently, the Common Core State Standards included learning goals that clearly refer to mathematical thinking, such as "make sense of problems and persevere in solving them," "reason abstractly and quantitatively," "model with mathematics," and "use appropriate tools strategically." Katz & Lindell ((2014), explained that mathematical thinking is an important ingredient of inquiry-based mathematics education. The importance of mathematical thinking is also widely acknowledged, since teachers have to move from "answer telling and procedure teaching" to raising thought-provoking questions and teaching mathematical thinking (Mason, 2000). Due to this shift, however, mathematics in schools differs drastically from mathematics in a professional or academic setting (Devlin, 2012).

There are three viewpoints to acknowledge the importance of mathematical thinking as a learning goal as well as a problem-solving tool (Mason, 2000; Pólya, 1962; Schoenfeld & Sloane, 2016). First, the problem-solving refers to what Pólya described as "finding a way out of a difficulty, a way around an obstacle, attaining an aim which was not immediately attainable" (Pólya, 1962, p. v). It also provides learners a possible solution strategy (Doorman et al., 2007) or an integrated hybrid problem based learning (Kassem, 2018). What is non-routine depends on the student's experience, preliminary knowledge, talent, and skills. Developing a repertoire of heuristics is an important element in problem-solving skills. A second angle to acknowledge mathematical thinking as a problem solving tool requires inventing real mathematics to solve problems. In other words, through mathematics education, it is important to predict developments, or optimise processes (Blum, Galbraith, Henn, & Niss, 2007; Kaiser, Blomhøj, & Sriraman, 2006) through a modelling approach in the curriculum design. A third angle is to consider mathematical thinking as an abstract perspective, a kind of isolation of specific attributes of a concept (Mason, 1989). White and Mitchelmore (2010), developed a model for teaching abstraction in mathematical thinking and recognised that problem-solving, modelling, and abstracting are important elements of mathematical thinking. Their model for mathematical thinking thus integrated problem-solving, modelling, and abstracting.

Slow Learners

Yunis (1998:30) mentioned that one of the most important reasons of using computers in education is for learners of special needs who are either gifted or handicapped and are much benefited by artificial intelligence based programs. Among such learners, those who have a mental disability or some kind of retardation, perform low academically. Such learners are classified as slow learners and this category numbers 20% to 30% of the total number of students in Saudi Arabia (Ibrahim, 2003). In the IQ Raven test conducted for this study, a slow learner in mathematics is a learner who gets 25% or less, which represents less than average. According to the National Association for School Psychologists, the percentage of slow learner kids is 14.1% of the total number, which means that their number is greater than students with learning disabilities and mental retardation. Additionally, this percentage increases in the poor areas and this makes everyone pays attention to those students and supports them academically, especially in the subjects such as mathematics (Mc Manus, 2005: 5). A study was conducted in Colombia in 1997, in which some tests were administered on 364 pupils. The study results revealed that 183 pupils out of the total number of the pupils were slow learners and this percentage represented 23% of the total number of school pupils.

Regarding the Saudi Arabian context, the percentage of slow learners is also not small, estimated at 20 out of 100 learners. It is much emphasised to focus on such a category of learners, to give much attention, care and appropriate educational programs (Sadek, 1982), including the blackboard (Kassem, 2018; Ilyas, 2018). Further, providing them with various aids to perform well in Mathematics through using more than one sense at the same time is also much needed. This can be done by using more than one sense via a dynamic instructional technology based on entertainment and attraction. Also, such a technology provides audio signals and a prompt consolidation and multiple presentation methods.

Methodology

The researcher adopted the quasi-experimental design to select the sample of the study. The population consisted of 314 pupils, both boys and girls, from Alkharj intermediate schools, while as the final sample, 120 pupils both boys and girls were selected, who faced learning difficulty in mathematics, representing 38.21% out of the total number, with the average age of 14.23 years old and .06 for standard deviation. The researcher identified slow learners on the basis of their second year scores in mathematics. Those whose scores were less than the average were classified as slow learners, taking into consideration their level in an IQ test. Their scores represented 25% in the IQ test for Raven, which means that their intelligence was less than the average.

Further, the researcher validated their selection from their teachers, who agreed that those pupils did not participate effectively in mathematics classes and their academic achievement in mathematics was low. The sample of 120 was also divided into three groups, two were experimental and one was a control group, with 40 students in each group. The researcher adjusted three variables, Age, Intelligence and Mathematical Thinking. These variables were deemed to be affecting the results. After selecting the study groups and adjusting variables, the researcher assured the equivalence of the three groups before the treatment by calculating variance analysis in mathematics and the results of the ANOVA test, which resulted in no statistically significant differences between the study groups.

Instruments of the Study

Raven's Progressive Matrices Test

The researcher used the frequent matrix test for Raven to determine the general mental level of pupils in order to select the sample group of slow learners. The test was administered on 314 pupils and the researcher considered a pupil who scored 25 or less in the IQ test for Raven was a slow learner. The Raven Test contained the progressive matrices test, which consisted of five groups (a, b, c, d, e), each consisting of 12 items and the total number of test items was 60 with the difficulty scale of five levels. Abu-Hatab et al (1977) had administered the test on a Saudi sample consisting of 4932 students, boys and girls from schools, institutes and universities and he found that the test was valid and consistent. Also, the researcher calculated the consistency level using the Alpha Cronbach equation on the pilot study, and it was (0.076).

Mathematical Thinking Test

This test aimed to measure the slow learners' ability in mathematical thinking. Five components of mathematical thinking were determined to cope with slow learners. These components were induction, education, relationships perception, symbols expression and mathematical proofs. The researcher found that the test time was 35 minutes approximately. Further, the researcher calculated the easiness and difficulty level for each item in order to omit the very easy or difficult question items. The easiness level ranged from 0.023 to 0.79, while the difficulty level ranged from 0.21 to 0.77, which meant the question items were suitable for the students' level.

In the current study, the researcher used the following two methods to assure the test validity: the researcher calculated the consistency level of the test by using two methods: the Alpha Cronbach equation, whose consistency level was calculated to be (0.071); and the Split half method whose correlation coefficient was calculated using the split half method and it was (0.086). The mathematical thinking test was submitted to a group of faculty members (11) to test its validity in terms of the appropriateness of the question to the components of mathematical thinking. The experts measured various factors like the suitability of the question items for the students' level, the clarity of the question items, and the appropriateness of the test items distribution to the critical thinking components and the possibility of adding, omitting or modifying some questions. The experts suggested some modifications on the test, such as the need for drawing the geometric figures accurately.

The correlation coefficient between the pilot study pupils' scores in the mathematical thinking test and pupils' scores in mathematical thinking test was also calculated. The correlation coefficient was (0.76), which is significant at the level of (0.01).

Findings and Discussion

Question 1: What is the effectiveness of learner control strategy in developing slow learners' mathematical thinking in math?

To answer this question, the researcher calculated the t-value of the scores of the first experimental group (learner control) and the control group in the post implementation of the mathematical thinking test, as shown in table (1).

Table 1:

Group	Number	Mean	Stand. Deviation	T	Sig.
Experimental (1) (Learner control)	40	30.45	3.84	21.11	0.01
Control	40	11.24	4.17		

As shown in table (1), there are statistically significant differences at the level of (0.01) between the mean scores of the first experimental group (learner control) and the control one in the post implementation of the mathematical thinking test, favouring the experimental group. Based on findings, these results are due to a number of factors:

1. The learners were provided with different options such as selecting the content, self-learning, feedback and motivating the learner to find the correct answer.
2. Developing the slow learner's mathematical thinking was due to the freedom the learner gets to take enough time to learn.
3. Designing computer programs enabled learners to control learning according to their experience.
4. The suggested program helped the learners to implement a general rule in order to prove its validity and this helped their mathematical thinking.
5. It also helped slow learners to understand verbal mathematical concepts.
6. The suggested program according to the learner control strategy helped slow learners to figure out the mathematical theories and use symbols expression.
7. The suggested program, according to the learner control strategy, encouraged slow learners to transform the mathematical words and sentences into symbols and mathematical equations.

8. The suggested program encouraged the learners to write logic statements and make proofs and justifications.
9. The suggested program included different topics which measure slow learners' mathematical thinking.
10. The suggested program presented interactive topics in an interesting way that enabled slow learners to get the correct answers by themselves, using their thinking, not by chance.

Based on the above mentioned results, the present study concurred with some other studies in terms of using learner control. For instance, Milheim (1990), had also concluded that using learner control gives a high percentage of achievement and decreases the learning duration compared to using program control. Al Maghraby's study (1995), also concurred with the present study in acknowledging the superiority of learner control strategy over program control in immediate and postponed achievement. Also, the findings of the present study are consistent with that of Hsin-Yih and Brown's study (1995), which also agreed with the effectiveness of learner control as well as its efficiency and attitudes towards learning.

Several other studies found similar statistical results. For instance, Safaan's study (2000), concluded that there were statistically significant differences at the level of (0.05) between the mean scores of the experimental group who received instruction through learner control and the mean scores of the control group who received regular instruction favouring the experimental group students. Similarly, Yeh & Lehman (2000), concluded that using learner control by slow learner is effective, especially in English language; while McManus's study (2006), concluded that there were statistically significant differences between the mean scores of the experimental group and the control one in mathematical thinking, favouring the experimental group.

Question 2: What is the effectiveness of program control strategy in developing mathematical thinking for slow learners in mathematics?"

In answering this question statistically, the researcher calculated the "t value" of the post-implementation of the mathematical thinking test for the second experimental group (program control) and the control group, as shown in table (2).

Table 2:

Group	N	Mean	Stand. Deviation	T	Sig.level
Exp. (2) Program Control	40	28.26	4.13	16.68	0.01
Control	40	11.24	4.17		

Table 2 exhibits statistically significant differences at the level of (0.01) between the mean scores of the Experimental Group 2 (Program Control) and Control Group, favouring the Experimental Group 2. Based on findings, these results are due to the following factors:

1. The learner is not given control over some educational factors, such as choosing the content, repeating and controlling classroom activities and assignments, and accelerating forwards or backwards. This would help the learner to listen to the teacher and might help develop mathematical thinking.
2. The learner becomes more careful about his/her study as much as possible, because of his/her understanding that what is left from the program can be restored, unlike in the learner control strategy. He now understands that any subject can be restudied any time, which leads to developing mathematical thinking.
3. When implementing program control strategy, the process of controlling some factors is determined before the start of the program. The learner is not allowed to control it, except through self-paced learning. This is due to the nature of mathematics, which requires time to understand, and this varies from one individual to another. Also, it requires outreaching more thinking about understanding, which may help in developing mathematical thinking.
4. Any teaching program based on program control strategy helps slow learners pay attention to the relationship between the general rule and special cases, and conclude a sequence of the sequent of results leading to a solution, which helps in developing mathematical thinking.
5. A teaching program based on program control strategy would also help slow learners in realising the importance of mathematical processes, being aware of application, the ability to solve exercises and mathematical problems, and using deduction, education, realising relationships and using symbols to express the mathematical concepts.
6. Such a proposed program, according to program control strategy, would help slow learners move thinking from concrete to semi-concrete and then to abstract, which would lead to learning mathematical concepts and skills, and solving mathematical problems successfully. This may help in developing mathematical thinking.
7. A proposed program, according to program control strategy, would also help slow learners in reforming the statements of theories and mathematical definitions, as well as solving exercises and mathematical problems using their own language in mathematical symbols.

Based on the above results, the current study concurs with the study of Lee & Lee (1991), which shows the superiority of program control strategy during the acquisition stage. Further, Ibrahim (1999) and Mohamad (2006), have shown that learners in program control strategy completed a great number of question items and examples, more than those in the learner control strategy. Sayed (1996), too, showed a distinguishing performance of the review group in the light of program control strategy, and the interaction between the group, the strategy and intelligence was significant. Young's (1996) and Karnik's (2004) study also showed a significantly low performance of the low performance group in terms of self-organisation related to learner control in three groups. Ibrahim's study (1999), also showed statistically significant differences favouring the post implementation of the three experimental groups.

Question 3: Which of the two strategies (Learner control/Program control) is more effective in developing mathematical thinking for slow learners in mathematics?

To answer this question statistically, the researcher calculated the t-value of the results of the post implementation for the mathematical thinking test on the first experimental group (learner control) and the second experimental group (program control) as shown in table (3).

Table 3:

Group	N	Mean	Stand. Deviation.	T	Sign. level
EXP.(1) Learner control	40	30.45	3.84	1.77	Not significant
Exp.(2) Program control	40	28.86	4.13		

As shown in table (3), regarding the results of the post implementation of the mathematical thinking test, there are statistically significant differences between the mean scores of slow learners in the first experimental group (learner control) and the second experimental group (program control). Based on findings, these results are due to the following:

1. There are advantages to using computers in both learner and program control strategies, which make the learner active and enforce his/her ability for learning and mathematical thinking. This helps decrease the differences between the two strategies in developing mathematical thinking.
2. The use of computers also helps slow learners to reach a specific conclusion by some evidences, notes and special examples, and helps with examining an adequate number of individual cases and getting the features which the other cases have.
3. The computer also helps slow learners move from whole to part and from general to individual cases, and get the solution of a mathematical problem, approved as mathematically and logically valid.
4. The computer helps slow learners learn how to transfer the mathematical concepts and cases in order to simplify the mathematical operations and facilitate mathematical thinking.
5. The computer also helps slow learners to reach deductive relationships between introductions and results and make logical justifications and proofs to reach a solution, and helps them conclude new relationships and information which have never studied before.
6. The computer also helps slow learners process words and symbols to track statements and draw conclusions from the previous one, as per valid evidences such as theories and postulates.

7. The computer also helps slow learners in mathematics learn individually, and helps them respond accurately to mathematical tasks such as deduction and mathematical proofs, which helps in developing mathematical thinking, according to the two strategies.
8. The findings also revealed that an increase in the interaction in completing the mathematical tasks of both strategies lead slow learners to get the answers through mathematical thinking, which proves that there exists no difference between the two strategies in developing mathematical thinking.

These results are consistent with those of Amin's study (2000), which showed that there are no differences in experimental group students' achievements according to learning control strategy, in spite of high scores of students' achievements of the internal adjustment border, while there are statistically significant differences at the level of 0.01 between the mean scores of the experimental groups and other groups, favouring the groups of learner control and guided control of the internal adjustment border and learner control of the external adjustment border.

Recommendations of the Study

1. The study recommends an active use of computers in designing computer instructional programs for slow learners, taking into consideration the nature of this category and its different characteristics.
2. It is suggested to encourage teachers to design and use computer programs in teaching slow learners in mathematics.
3. It is necessary to train teachers in how to deal with slow learners when teaching them via computer, and explaining to them the role of the teacher and not just relying only on computers in the educational process.
4. It is suggested that slow learners should benefit from the suggested computer based program.

Conclusion

This study is significant for the slow learners and their needs, to improve their levels to continue their studies in a way that qualifies them to contribute effectively. Such pupils are often full of energy that should be exploited to soften the negative impacts caused by their lack of natural competences (Beckers, 2019). The current study aimed at finding appropriate ways to help slow learners improve and develop their motivation in order to accelerate learning. To conclude, this study thus has shown the evidence that any customised and compatible computer program, based on learner control and program control strategies can facilitate slow learners to develop their learning autonomously and select topics that suit their interests and needs. Such a computer program based on learner control and program control strategies can also help slow learners acquire proficiency in different school subjects. Such an approach can also motivate mathematics teachers to use such interesting methods of teaching that fit learners' levels. Last but not least, this approach can also help educationalists to provide services that help slow learners to improve their academic performances. This is fully categorised as an educational and remedial program that helps slow learners develop themselves and train them n the necessary skills they need in their lives.

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