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The effectiveness of the flipped learning strategy in developing the critical thinking and accounting skills of commercial technical secondary school students

Introduction. As pedagogical practices evolve, the flipped learning strategy has emerged as a significant approach, especially in technical subjects like accounting. By prioritizing student-centered activities over traditional lectures, this method has demonstrated efficacy in enhancing comprehension of complex topics.

The research aimed to identify the effectiveness of the flipped learning strategy in developing the critical thinking and accounting skills of commercial technical secondary school students.

Study participants and methods. The study involved (160) students in the second year of technical and commercial secondary school for Girls divided into two groups, one of which represents the experimental group (80) students, and the other representing the control group (80) students. To achieve the goal of the research, the researcher prepared a list of accounting skills and a list of critical thinking skills in financial accounting. The researcher utilised SPSS for data analysis, calculating means and standard deviations and conducting the "T" test and the Eta square equation to test the research hypotheses and evaluate the effectiveness of the flipped learning technique on students' accounting knowledge and analytical prowess.

The results. The study looked at how well the flipped learning method helped students in their second year of commercial high school with their accounting and critical thinking. The average score for the experimental group of 80 students on the financial accounting performance attitudes test was 72.38, with a standard deviation of 3.513. In contrast, the standard deviation was 7.507 points for the comparison group of 40 students. Assuming a significance threshold of 0.05, the estimated t-value for this difference was 25.601, and an Eta square value (2) of 0.89 showed a large effect size with a D value of 5.69. The average score for the experimental group was 61.18 (SD = 2.969) on the test of critical thinking skills, while the average score for the control group was 33.23 (SD = 3.490). A t-value of 38.581 indicates statistical significance at the 0.05 level for this difference. D = 8.72, which is quite high, and 2 = 0.95, which is consistent with the flipped learning technique having some effect on this test. In addition, there was a significant positive relationship between accounting competence and critical thinking abilities among the experimental group students, as shown by a Pearson correlation coefficient of 0.928 between scores on the performance attitudes test in financial accounting and the critical thinking skills test.

Conclusions. The research showed that second-year students in commercial technical high schools benefited greatly from the flipped learning technique in terms of improved accounting and critical thinking abilities. Compared to their counterparts in the traditional learning environment, students who were exposed to the flipped learning approach had considerably greater accounting proficiency and critical thinking scores. Students in the control group did not show the same strong positive link between accounting knowledge and critical thinking skills. Based on these results, further study might focus on refining the flipped learning model, examining its viability in other technically-oriented fields, and investigating its potential for use in a wider range of educational settings.

Keywords: flipped learning, critical thinking, commercial technical secondary schools, financial accounting

For Reference:
INTRODUCTION

The United Nations Educational, Scientific, and Cultural Organisation (UNESCO), the Council of Europe, and the International Association of Universities (IAU) have all stressed the importance of creative teaching methods that help students develop the analytical reasoning skills necessary to succeed in the modern world. The United Nations Educational, Scientific, and Cultural Organisation (UNESCO), for example, has long promoted educational policies that encourage students to think critically and creatively. Its "Education for Sustainable Development: Towards achieving the SDGs" (ESD for 2030) programme stresses the importance of providing students with a "transformative" education that improves their academic, social, and emotional development [1].

Critical thinking is highlighted as an essential democratic talent in the Reference Framework of Competences for Democratic Culture published by the Council of Europe [2]. This knowledge allows people to be productive citizens, which is crucial for the survival of democracy on the continent.

Higher education institutions have been emphasised by the International Association of Universities (IAU) for their role in fostering novel pedagogies that cultivate critical thinking skills, which are essential for addressing the complex societal issues that are faced worldwide [3]. The emergence of flipped learning as a promising pedagogical method within this worldwide agreement on the necessity of critical thinking is particularly evident in technical fields like accounting that require both technical and analytical expertise.

The flipped learning model is not only a passing fad in education, but rather is grounded in the central idea of creating classrooms that are focused on the needs of the students. This approach has great promise for developing students' critical thinking and subject-specific skills because it prioritises these activities over the passive consumption of knowledge.

The purpose of the following research is to investigate whether or not the flipped learning technique is effective in helping students at commercial technical secondary schools improve their critical thinking and accounting skills [4].

The educational process can be thrown off by changes in technology, the economy, and society. Higher education is under increasing pressure to adapt to changes in information technology, interactive tools, analytical ability, and opportunities for personalization [5; 6]. Content-based education is increasingly seen as insufficient for preparing students for the needs of the modern world. A lack of motivation and distraction from smartphones and social media appear to be major problems in the classroom [7]. Universities and business schools are competing in an innovation arms race in response to the pressing need for change. Various instructional strategies are being tested and adopted to help students stay interested in their studies and obtain the knowledge and experience necessary to become successful future managers. Those alterations can be aided by student-centered, active learning approaches [8]. The academic literature features extensive comparisons between active learning methodologies and more traditional approaches to education [9; 10]. Strategies like design thinking [11], creative learning [12], and flipped classroom [13] among others, that were investigated and lauded as successful responses to current shifts in the educational system. However, critical thought on these methodologies is required to validate their application and foresee potential difficulties and hazards associated with their rash adoption. Burke and Fedorek [14] are only two examples of studies that conclude that
flipped classes are effective. However, the growth of associated theory and the progress of effective practises are hampered by ignoring what can go wrong during the implementation of active learning approaches.

A form of blended learning known as "flipped classrooms" (FC) involves showing students lecture videos online before in-person meetings. Gilboy et al. [15] and Tune et al. [16] are just two of many authors who highlight the positive effects of flipped classrooms on student involvement and, ultimately, learning. Student engagement, preparation, and independent learning are all improved by FC, according to the literature [17; 18].

Developing thinking skills is one of the important goals that teaching financial accounting seeks to achieve, due to the practical applications the subject contains. Many studies, including the study of Thompson & Washington [19] which aimed to convey the authors’ use of the ABCs of teaching accounting model; while Paulson study [20] aims to introduce and evaluate a classroom exercise based on a genuine, ongoing transaction in the field of mergers and acquisitions; Cascini and Rich [21] aimed to explore and assess the efficacy of tools, specifically simulations and rubrics, in developing critical thinking skills among accounting students. Developing critical thinking skills in financial accounting has a positive and effective impact on students, which helps them improve their performance in practicing accounting skills and solving scientific problems they face in the labor market.

Therefore, the flipped learning strategy is one of the modern solutions that allows focusing on the higher levels of Bloom’s classification (analysis - synthesis - evaluation), which makes it well suited to the nature of critical thinking. In addition to what many studies have confirmed that flipped learning contributes to the development of critical thinking and many other skills, as a positive correlation was found between the flipped learning strategy and critical thinking skills.

The study problem
The problem of the research is that there is a deficiency in the level of performance of commercial secondary school students in accounting skills and the extent of their mastery of critical thinking skills. This is due to teachers’ reliance on traditional teaching strategies based on memorization and recall, and this is not consistent with the nature of the subject.

Research hypotheses
1. The performance attitudes in financial accounting of students in the experimental group differ from those in the control group after the application of the designated intervention.
2. The critical thinking skills in the field of financial accounting of students in the experimental group differ from those in the control group after the application of the designated intervention.
3. There is a relationship between accounting skills and critical thinking skills among second-year commercial secondary school students.

Research objectives
The research aimed to identify the effectiveness of the flipped learning strategy in developing the critical thinking skills and accounting skills of commercial technical secondary school students.

First: The theoretical framework of the research and previous studies:
The theoretical framework of the research includes the following topics: financial accounting, flipped learning, and critical thinking
• **Financial accounting**

Financial accounting is the ability to perform accounting operations, record them in the journal, transfer them to the ledger, and balance them in preparation for preparing the trial balance, final accounts, and statement of the facility’s financial position during a specific period of time, so that these operations are accomplished with an appropriate degree of speed, accuracy, and proficiency with economy in time, effort, and costs.”

Stages of developing financial accounting skills:

Financial accounting skills can be developed through:

1. Identification stage: The teacher determines the type of skills that he should teach his students. (For example: the skill of the joining partner to pay his share in the company’s capital in cash).

2. Development stage: In which the teacher explains accounting skills through educational videos so that the students get to know them and understand them well through exercises solved in an easy and simplified manner.

3. Acquisition stage: The teacher directs his students to apply the accounting skill in a scientific manner through the student’s performance of the skill, provided that the student’s performance is characterized by calm and self-confidence.

4. Follow-up stage: The teacher develops new accounting skills through guidance, guidance, and continuous follow-up while the student participates in solving worksheets inside or outside the classroom.

5. Feedback stage: The student replays the educational video more than once for incomprehensible points or through the teacher’s re-explanation of these points within the classroom environment.

6. The stage of forming habits and attitudes: Habits, values and attitudes must be formed among students and developed while they perform accounting skills such as: accuracy, honesty, order, arrangement...etc.

• **Flipped learning**

Flipped learning is a type of learning in which lessons are pre-recorded in the form of audio or video clips, which students watch outside the classroom before or after the class, and class time is devoted to discussions, activities, and other exercises.”

**Steps to implement flipped learning**

Steps for implementing flipped learning take place according to three main stages:

**The first stage takes place before the classroom:** the student must familiarize himself with the study material before attending the class session, whether through an educational video or a reading text that the teacher records to explain a specific lesson, or readings related to the topic of the lesson. Students are directed to focus on it without distractions that could reduce the student’s concentration while they follow the lesson, and to write down notes and questions about the educational content to discuss with the teacher in the class session.

**The second stage takes place during the classroom:** At the beginning of this stage, the teacher evaluates the learner’s understanding of the content he saw and the extent of the success of his effort in understanding this content through discussing and solving questions, and conducting individual and group activities.

**The third stage takes place after the classroom:** during which the teacher devotes sufficient time to continuing learning and practicing it.

The largest part of learning takes place outside the classroom because education here is student-centered, as students view the scientific material that the teacher sends to them, whether it is audio or video clips at home or anywhere outside the classroom, and write
down notes and comments on the subject, then apply what they have learned, answer questions, and discuss assignments in class. Thus, students achieve the greatest level of knowledge in flipped learning.

**Stages of implementing a flipped learning strategy**

The stages are as follows:

1. **Specifically:** the topic or lesson on which the class is intended to be flipped, provided that it is suitable for flipping, and specifying the actual time for the application, and the time for watching the video and discussions.
2. **Analysis:** The content of the lesson or topic into important values, knowledge, skills and concepts that must be known and others that help understanding.
3. **Design:** Educational or interactive video including scientific material with pictures and sound for a period not exceeding ten minutes.
4. **Directing the student to watch the video from the Internet or CD at home at any time, opening the door to discussions about it, and providing feedback.**
5. **Apply:** The concepts that the student learned from the video in the class through active learning activities and projects and provide the necessary reinforcement to groups and individuals.
6. **Evaluation:** Student learning in class using appropriate evaluation tools.

**Critical thinking**

Critical thinking is considered one of the most important educational goals to prepare individuals for life in the society of the twenty-first century, as it contributes to making the learner able to make sound judgment regarding the problems and issues surrounding him in commercial, social, political, scientific, this is done by examining the material of thought, establishing evidence and evidence, conducting comparisons, and issuing judgments away from personal aspects.

**Critical thinking skills**

- Analysis of the problem under study.
- Arriving at proposed solutions
- Explain and justify each of the solutions reached.
- Determine the most appropriate solutions.
- Evaluate the thinking strategies that have been followed in light of a set of specific criteria.

**Financial accounting and critical thinking**

Developing thinking skills is one of the important goals that teaching financial accounting seeks to achieve, due to the practical applications the course contains. Many studies [19; 21] have confirmed that developing critical thinking skills in financial accounting has a positive and effective impact on the student. Which helps them improve their performance in practicing accounting work and solving the scientific and practical problems they face in the labor market.

**PREVIOUS STUDIES**

Leão et al. [22] research aimed to examine what went wrong when an active learning strategy was put into practise. To enhance the learning process and give students a larger voice in the classroom, active learning strategies have arisen. The majority of research in this area is dedicated to improving teaching practises by looking at existing models of success.
However, critical analyses of failed attempts could also give fodder for new developments in this literature. The authors of this article conducted an in-depth case study of a failed implementation of the flipped classroom methodology in a business school for Brazilian undergraduates teaching basic statistics. Course syllabi, student evaluations, and two sets of interviews with the instructor were used to compile this data.

Astawa et al. [23] The purpose of this research is to determine whether or not students' confidence and analytical abilities in disaster mitigation resources improve after participating in a flipped classroom learning experience based on the visualisation of disaster maps. The research followed a controlled group pre- and post-test quasi-experimental design. Thirty students from both the experimental group and the control group (selected at random following the equivalency test) made up the research sample. The participants took a test consisting of 10 description items to measure critical thinking skills, and a questionnaire with 30 statements to measure self-efficacy. Quantitative descriptive and inferential statistics with MANOVA were used to examine the data. In conjunction with or independently of the sig value, the results reveal a significant effect. 0.05, so it's safe to say that students' confidence in their own abilities and their capacity for critical analysis of disaster mitigation resources improve when they participate in flipped classroom learning based on visualisations of hazard maps.

Pardosi & Ming [24] study aimed to determine if and how flipped classrooms influence the growth of undergraduates' higher-order thinking capacities (HOTS). Using a quasi-experimental approach, 70 Chinese 'teaching with technology' course enrollees majoring in scientific education were recruited for this study and randomly assigned to either a flipped or non-flipped group. Both groups were given a test of higher-order thinking skills before and after the intervention, and the results were analysed using a sample t-test in IBM SPSS version 24. Students in the flipped group had higher scores on the HOTS than those in the non-flipped group. Pre- and post-test scores for students in the flipped group were significantly different (p = 0.000 0.05). This data demonstrates that flipped learning instruction has a considerable impact on the growth of HOTS amongst Chinese undergraduates. This research helps fill a knowledge gap for professors and curriculum developers as they consider how to use a flipped learning model in higher education.

Alkhawaldeh & Khasawneh [25] The purpose of this research was to analyse the impact of a flipped classroom approach using smartphones on the English language skills of students who are blind or visually impaired. The research used a quasi-experimental design, and the study's sample included 18 blind and visually impaired students from Irbid's Senses Centre; 9 of these students were assigned to an experimental group that learned using the flipped classroom strategy implemented through the use of smart phones, while the remaining 9 students were assigned to a control group that learned using the more conventional method. A comparison of the control and experimental groups revealed statistically significant differences in favour of the experimental group. It was suggested in the study that the institute host workshops for its faculty to help them better understand the value of implementing innovative pedagogical practises like the flipped classroom strategy and how to modify them using mobile apps and other cutting-edge technology for the benefit of the blind and visually impaired.

José et al. [26] research aimed to examine how students feel about the enhanced flipped classroom method and how it affects their performance in class. Two sections of accounting undergraduates taking the same research methods course used the flipped classroom model for four sessions. A total of 78 students from a Brazilian public institution
made up the sample. Every flipped class started with homework, and students were expected to share and vote on any issues they were having with the task beforehand. Two assessments were given in each session based on students' responses to polls and group projects completed without the instructor's guidance. Results from standardised tests demonstrated that all flipped classrooms benefited greatly when group work was integrated into the learning process. Additionally, student feedback was gathered via survey, and they agreed that improved flipped classroom was a good method of instruction. The educational processes can be enhanced by encouraging the use of active approaches and technological resources in universities.

Başaran [27] Through a meta-thematic analysis of qualitative studies, this research seeks to ascertain the impact of the flipped classroom, one of the activities and student-centered models, on students' cognitive, affective, and social development, after applying these criteria to a screening process, a total of 683 studies were identified, of which 71 met the criteria to be further examined using the content analysis method. The flipped classroom concept has been shown to improve students' performance in school because it encourages active participation in the learning process, which in turn boosts students' learning motivation and decreases the stress associated with not learning.

Dusenbury & Olson [28] aimed to determine if aviation students' views and grades in a human factors course were affected by the implementation of flipped learning. A total of 81 students from a sizable institution in the Midwest took part. Students' opinions were gauged with the help of the Course Evaluation Survey (CES), while their actual performance was evaluated through tests. Researchers utilise t-tests on paired samples, t-tests on independent samples, and a MANCOVA to examine the data. The results suggest that the flipped classroom is not more effective than the traditional lecture format. Furthermore, total course satisfaction was much greater among the lecture group. These results show that students are accustomed to lecture and that switching instructional approaches is more complex and will take more time for students to adapt to.

Shih & Tsai [29] research aimed to examine how students in a marketing research course at a technical university felt about using a flipped classroom approach to facilitate online project-based learning (FC-OPBL). The goals of this joint approach were to raise standards in both classroom instruction and student performance. A total of 67 college students were polled from a marketing research course. To investigate how students felt about the instructional approach taken, a mixed-methods study was conducted using a questionnaire, semi-structured interviews, online learning notes, and online discussions. The findings suggested that FC-OPBL might promote students' diversified growth and teamwork while also improving their learning effectiveness, motivation, and interest. Finally, some recommendations for further study and teaching in the flipped classroom setting are provided.

Lee [30] study aimed to explore the value of utilising a flipped classroom style and to experiment with its implementation in an undergraduate English learning course. Through the use of the school's eLearning platform and other online learning activities, the flipped classroom model improved upon the connection between in-class and outside-of-class learning. The purpose of this study is to determine whether or not pupils benefit from this novel strategy. According to the results, the overall effect on students is positive, and those who have taken the TOEIC before report higher levels of satisfaction. Moreover, in a fruitful educational encounter, consideration was given to additional online tutoring and supplementary resources. This study provides suggestions for how ESP teachers of ESL/EFL should put into practise a novel flipped curriculum and materials design.
Multiple studies investigating the flipped classroom paradigm weave together numerous important insights into today's pedagogical practices. Not all attempts to use active learning methodologies are successful, as has been shown by a number of research that delved into their benefits and drawbacks. This viewpoint is essential because it stresses the significance of objectively assessing outcomes, both positive and negative, in order to have a whole picture.

The flipped classroom paradigm, on the other hand, has been linked to improved student results in numerous research efforts. Students' confidence and analytical skills improved, and their ability to think critically and creatively expanded, when visual aids were incorporated into lessons at the undergraduate level. Group projects and other forms of student participation only served to increase the flipped classroom's already impressive benefits. It was also emphasised that technology has revolutionary potential, particularly in meeting the needs of students with disabilities. When smartphones were used as a means of learning, for instance, those with visual impairments benefited greatly from a flipped classroom approach.

It's important to remember, though, that switching from more traditional to flipped classroom practices isn't always a smooth process. Some research suggested that students, especially those used to a more traditional lecture style of instruction, would have difficulty adapting to this new method of instruction. Students were generally receptive to this novel approach in various settings, especially when supplementary materials and assistance were made available. While the flipped classroom approach has shown promising results in a variety of contexts, its adoption calls for careful forethought, customization to the needs of the target student population, and ongoing assessment and improvement.

**RESEARCH METHODOLOGY**

This research followed the following: The descriptive analytical approach: through studying and analyzing research and educational studies related to the various research axes, to address the theoretical framework of the research and prepare research tools.

Quasi-experimental approach: to measure the effectiveness of the flipped learning strategy in developing critical thinking and accounting skills skills for students in the research group (experimental group and control group).

**Research tools**

The research used the following tools:

1. Testing accounting performance situations (prepared by the researcher).
2. Critical thinking test (prepared by the researcher).

**Search procedures**

To answer the research questions and verify the validity of the hypotheses, the following steps were followed:

1. Preparing a list of accounting skills that must be available for second year commercial secondary school students through the following:
   - Educational literature related to accounting skills.
   - Previous Arab and foreign research and studies related to accounting skills.
   - The nature of the financial accounting subject.
2. The list was presented to some arbitrators in the field of accounting, curricula and teaching methods for commercial education and amended in light of their opinions.
3. Preparing a list of critical thinking skills that must be available to second-year commercial secondary school students through the following:
   - Educational literature related to critical thinking skills.
   - Previous Arab and foreign research and studies related to critical thinking.
   - The nature of commercial secondary school students.
4. The list was presented to some arbitrators in the field of curricula and teaching methods for commercial education and educational psychology and modified in light of their opinions.
5. Selecting two units from the financial accounting course for second year commercial secondary school students and preparing them according to the list of accounting skills and the list of critical thinking skills using the flipped learning strategy.
6. Preparing student work papers in the selected units of the financial accounting course and presenting them to some arbitrators for review.
7. Preparing a teacher’s guide for teaching the content of the selected units of the financial accounting course according to the flipped learning strategy and presenting it to some referees for review.
8. Preparing a performance situation test to measure financial accounting skills, prepared by the researcher and presenting it to some arbitrators for review.
9. Preparing a critical thinking test to measure critical thinking skills in financial accounting, prepared by the researcher, and presenting it to some arbitrators for review.
10. Choosing the research sample, which consists of two groups, one of which represents the experimental group taught using the flipped learning strategy, and the other represents the control group taught in the traditional method.
11. Applying research tools in advance to the research sample.
12. Teaching the selected units to the two study groups (experimental and control).
13. Applying research tools remotely to the research sample.
15. Interpretation and discussion of results.

**Second: Field research procedures**

The research proceeded according to the following procedures:

- Prepare a list of accounting skills

  The researcher analyzed the content of the financial accounting book for the second year of commercial secondary school to extract a list of the accounting skills included in it, through two consecutive periods separated by a period of time (two weeks), then I calculated the percentage of agreement between the two analyzes using the Holsti equation, and the percentage of reliability of the analysis for the list of accounting skills was approximately (97%), which is an acceptable percentage that can be trusted as a reliability of the analysis. Thus, a list of accounting skills was prepared and presented to a group of arbitrators for their review. The arbitrators indicated that some amendments had been made, then the amendments agreed upon by the arbitrators were made, and the list became final.
- Prepare a list of critical thinking skills.

  The researcher prepared a list of critical thinking skills, through:
  a. Select list sources:

    The list was derived through the researcher’s review of many Arab and foreign literature, research and studies related to developing critical thinking skills, and specialized references in the field of financial accounting.
b. Preparing the initial image of the list:
The researcher identified these skills, which included (4) main skills, represented by the following skills: interpretation, inference, analysis, and evaluation. Under each skill, several sub-skills were included, numbering (21) sub-skills.

c. The final image of the list of critical thinking skills:
The list was presented in its initial form to a group of arbitrators specialized in the field of curricula, teaching methods, and psychology to ensure its honesty and validity. In light of the arbitrators’ suggestions, some skills were modified and some sub-skills were deleted, and thus the final image included.

The list has (4) main skills, (19) sub-skills distributed as follows (4) sub-skills for the interpretation skill, (6) sub-skills for the reasoning skill, (4) sub-skills for the analysis skill, (5) sub-skills for the evaluation skill. The arbitrators indicated that some amendments should be made, then the amendments agreed upon by the arbitrators were made and were appropriate to the nature of the research, and the list became final.

- Choose the two academic units
The units “Accounting treatment for joining or separating a partner” and “Liquidation of a company” were selected in the second part, “Accounting for Sole Proprietorships” from among the units of the financial accounting course for students of the second year of technical and commercial secondary school for the academic year 2022-2023 in the second semester of my study. This is because the two units include many accounting skills and critical thinking skills that contribute to the richness of accounting knowledge and stimulate student thinking, compared to the other units of study in this course.

- Reformulating the two study units in light of the flipped learning strategy.
The researcher prepared lessons for the two units “Accounting Treatment for Joining or Separating a Partner” and “Liquidating the Company” for the experimental group in light of the flipped learning strategy by preparing and designing a set of audio and video educational videos to explain the lessons of the two units according to the list of accounting skills and the list of critical thinking skills, through the researcher using several Programs as follows:
  - PowerPoint 2010 P
  - Recorder Voice Ea is an easy voice recorder program
  - Adobe Premiere Pro CC 2017 Adobe Premiere Pro

The researcher uploaded the produced videos to YouTube, Tube You, and Cloud Sound, as well as to the class that the researcher established on the Easy Class platform, in addition to placing the produced educational material on a group of flash drives and CDs.

- Preparing student work papers
The researcher prepared student worksheets used by students in the experimental group while teaching the two units “Accounting Treatment for Joining or Separating a Partner” and “Liquidating a Company” from the financial accounting course for the second year of technical and commercial secondary school in the second semester using the flipped learning strategy. The number of student worksheets reached “thirty-five” worksheets, where the “Accounting Treatment of Joining or Separating a Partner” unit included “twenty-six” worksheets and the “Company Liquidation” unit included “nine” worksheets, and they were presented to a group of arbitrators to express their opinions on the student’s work papers. Some of the arbitrators made a number of observations and made some amendments, and the student’s work papers became in their final form.
• Preparing a teacher’s guide for teaching the two units

The researcher prepared a teacher’s guide to guide him when teaching the selected units using the flipped learning strategy. The guide was presented in its initial form to a group of arbitrators to verify its validity in achieving the desired goals of the research for second-year technical and commercial secondary students. Amendments were made, either by deletion, addition, or change, in light of the opinions of the arbitrators, and the guide took its final form.

After implementing the above procedures:

Content Modification

The use of the flipped learning technique necessitated a radical reorganisation of previously established syllabi. Lectures and classroom instruction used to be the primary means of imparting knowledge. The flipped classroom concept, on the other hand, turned these receptive learning strategies into dynamic, student-centered ones.

Independent Learning Materials:

1. Digital Resources: The sections "Accounting Treatment for Joining or Separating a Partner" and "Liquidation of a Company" were taken and adapted into a series of audio and video instructive videos to further illustrate their respective core topics. In preparation for class, students primarily relied on these videos.

2. Online Platforms: The finished videos were shared on sites like YouTube and Cloud Sound. In addition, we set up an online meeting space using Easy Class. This gave them the freedom to learn at their own speed and access the resources whenever they wanted.

3. Offline Materials: Flash drives and CDs were also made accessible so that students who may not have constant access to the internet may still view the course materials.

4. Student Worksheets: In addition to these materials, pupils were given 35 worksheets to complete. These were developed to give students real-world experience with accounting functions and critical thinking activities.

In-Class Activities:

After students had used the supplemental materials outside of class, classroom time was redirected to further in-depth study of the topic:

1. Discussion Sessions: Teachers led class discussions on accounting practices and principles, during which students could raise questions, clarify misconceptions, and engage in healthy debate with their peers.

2. Practical Application: Class time was often devoted to practical exercises, such as working through challenging accounting problems, playing a role, or analysing a case study.

3. Peer Learning: Students frequently worked in groups or pairs on assignments, creating a more interactive classroom setting. This not only helped them retain the information, but it also developed their analytical skills.

The flipped learning strategy used in this research was essentially a combination of new media and tried-and-true teaching methods meant to make students' education more engaging and fruitful. Students were able to not only absorb knowledge, but also apply it and be invested in the material thanks to a balance of individual and group work in the classroom.

Third. Preparing research tools

A. Preparing the performance situations test

This test is prepared according to the following steps:
**Objective of the test**
The Performance Attitudes Test aims to measure the accounting skills of second year technical and commercial secondary students included in the two units “Accounting Treatment for the Joining or Separation of a Partner” and “Liquidation of the Company”.

**Test correction method:**
To correct the performance situations test, which consists of ten situations, the following steps were followed:
The student is given a score of “one” for each correct performance of each situation, and a “zero” is given for answering incorrectly or leaving the question unanswered.

**Test validity**
To verify the validity of the test, it was presented to a group of arbitrators in the field of curricula and teaching methods, with the aim of ensuring that the test is related to the goal for which it was prepared. The arbitrators suggested amending the wording for some situations, and deleting some of the words included in the introduction and others from it, amendments were made, according to the opinions and comments of the arbitrators, and it was prepared for application to the exploratory group.

**Exploratory testing experience**
The test, consisting of (10) ten performance situations, was applied to a group of female students in the second year of commercial secondary school (other than the research group), consisting of (30) thirty female students, with the aim of determining the following:

**The appropriate time for the test**
The appropriate time for applying the performance situations test was determined by calculating the sum of the times taken by all students to answer the test and dividing it by the number of students. Thus, the time required to answer the test questions was 62 minutes.

**Calculate test reliability**
The test reliability coefficient was calculated by re-applying the test to the same exploratory group with an interval of two weeks between the two applications, using the Pearson correlation coefficient equation (Ali Maher, 2008, 165), where the test reliability coefficient reached (0.86), this means that the test is based on a high reliability coefficient that indicates the possibility of its use.

**B. Preparing a critical thinking test:**
This test was prepared according to the following steps:

**Determine the purpose of the test**
The objective of the critical thinking test was to determine the extent to which the students of the research sample acquired critical thinking skills in the financial accounting subject after teaching them with the flipped learning strategy.

**Determine the test content**
Through the researcher’s analysis of the content of the financial accounting book prescribed to students in the second year of technical and commercial secondary school, the researcher chose the two accounting treatment units for the joining or separation of a partner and the liquidation of the company, because the two units cover a variety of topics, they help provide many appropriate activities for learners through which they can develop their critical thinking skills.

**Identify the skills that the test measures**
After reviewing many previous literature, research and studies in the field of critical
thinking and referring to a set of critical thinking tests and the content of the financial accounting subject, the researcher identified the critical thinking skills agreed upon by most previous studies and research, which are compatible with the mental abilities of the learners and the content of the financial accounting subject, and they are as follows:

- Interpretation skill (4 vocabulary).
- Reasoning skill (6 items).
- Analysis skill (4 items).
- Evaluation skill (5 items).

Thus, the critical thinking test included (19) items.

**Formulating test vocabulary**

The test vocabulary was formulated as multiple choice, completion, and essay vocabulary, with the aim of allowing the learner to express the ways in which he uses critical thinking skills in solving the vocabulary included in the test, in addition to facilitating the correction process, in addition to the possibility of answering the test items on the same paper, the test included (19) items distributed as follows: 6 multiple test items, 4 completion items, and 9 essay items:

**Test correction method**

The test was corrected according to the following steps:

- The student is given one point if his answer is correct, and zero if his answer is wrong for each of the objective questions.
- Answers that contain two or more answer marks or without an answer mark will be deleted.
- Setting a number of grades proportional to the number of steps the student takes to reach the correct solution to each essay question.

**Test validity**

To verify the validity of the test, it was presented to a group of arbitrators specialized in curricula, teaching methods, and psychology, to ensure its suitability to the critical thinking skills that were identified. The arbitrators unanimously agreed that this test was appropriate for the skills identified by the researcher, and based on that, the test became prepared for exploratory testing.

**Exploratory experiment for the test**

The test was applied to the same exploratory group mentioned above with the aim of:

**Determine the appropriate time for the test**

The average time to answer the test items was 43 minutes.

**Calculate the test reliability coefficient**

The test reliability coefficient was calculated by re-applying the test to the same exploratory group with an interval of two weeks between the two applications, using the Pearson correlation coefficient equation where the reliability coefficient reached (0.89). This means that the test is based on a high reliability coefficient indicating to the possibility of using it.

**Fourth. Field experiment**

The field experiment was implemented to unify (the accounting treatment for the joining or separation of a partner and the liquidation of the company) according to the following procedures:

**Choose a search sample**

The researcher selected the research sample from (80) students in the 2nd second
year of technical and commercial secondary school for Girls from two classes, one of which represents the experimental group 1/2, numbering (80) students, and the other representing the control group 2/2, numbering (80) students.

- **Homogeneity of the two research groups**
  To verify the homogeneity of the experimental and control groups, the performance attitudes test and the critical thinking test were applied to the female students of both groups in the second semester of 2018/2019 AD, in the period from 02/27/28/2019. The instructions for each tool were considered during application, and the following table shows the results reached:

  **Table 1**

<table>
<thead>
<tr>
<th>M</th>
<th>Tools</th>
<th>Experimental group</th>
<th>Control group</th>
<th>Calculated T value</th>
<th>Degree of freedom</th>
<th>Significance level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>R</td>
<td>M</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Performance situations test</td>
<td>5.30</td>
<td>1.757</td>
<td>5.45</td>
<td>1.839</td>
<td>0.373</td>
</tr>
<tr>
<td>2</td>
<td>Critical thinking test</td>
<td>5.65</td>
<td>2.359</td>
<td>5.93</td>
<td>2.291</td>
<td>0.529</td>
</tr>
</tbody>
</table>

  *The tabulated value of T is at the level (0.05) for a degree of freedom (78) equal to 2.000.*

  It is clear from Table 1 that the calculated “T” value is not statistically significant in the performance attitudes test and the critical thinking test, which indicates the homogeneity of the two groups.

- **Experiment implementation**
  The unit (Accounting treatment for the joining or separation of a partner and liquidation of the company) was taught to the students of the research group, in the second semester of the academic year 2018/2019, in the period from 3/3/2019 to 4/7/2019, in two sessions per week. Teaching the two units took place 12 academic classes. Teaching was done as follows.
  - Relative to the experimental group: The two units were taught using the flipped learning strategy, and the researcher was keen to teach it herself for a number of reasons, the most important of which are: recording observations made during teaching, which could benefit the research when interpreting some of the results that were reached.
  - As for the control group, it was taught in the usual way without intervention with any experimental treatments.

- **Post application**
  - After completing the teaching for the experimental and control groups, the performance attitudes test and the critical thinking test were administered post-test. The grades were monitored, treated statistically, and analyzed to extract the most important results.
**Fifth. Statistical methods**

To answer the research questions and test the validity of its hypotheses, the researcher analyzed the data using the statistical package SPSS in order to calculate the following:

- Arithmetic averages and standard deviations.
- “T” test to determine the significance of the differences between the means.
- The size of the effect of the treatments using the Eta square equation, $\eta^2$, to measure the size of the effect of the independent variable (flipped learning strategy) on the first dependent variable (accounting skills) and the second dependent variable (critical thinking).

**THE STUDY RESULTS**

The following is a presentation of the results that resulted from the research experiment, by testing the validity of each research hypothesis and then interpreting and discussing these results in light of the theoretical framework of the research and previous studies. This aims to identify the effectiveness of the flipped learning strategy in developing accounting skills and critical thinking skills for second year technical and commercial secondary students.

**Verifying the validity of the first hypothesis of the research**

Which states that (there is a statistically significant difference at the level of (0.05) between the average scores of the students of the experimental and control groups in the post-application of the test of performance attitudes in financial accounting, in favor of the average scores of the students of the experimental group.

To verify the validity of this hypothesis, the value of ($t$) was calculated and its significance for the difference between the average scores of students in the experimental and control groups in the post-application of the performance attitudes test in financial accounting. The following table shows this.

<table>
<thead>
<tr>
<th>Group</th>
<th>Students number (N)</th>
<th>Arithmetic Average</th>
<th>Standard deviation</th>
<th>Degrees of freedom</th>
<th>Calculated T value</th>
<th>Significance level</th>
<th>Eta square equation, $\eta^2$</th>
<th>D value</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>80</td>
<td>38.83</td>
<td>7.507</td>
<td>78</td>
<td>25.601</td>
<td>Significant at 0.05</td>
<td>0.89</td>
<td>5.69</td>
<td>Big</td>
</tr>
<tr>
<td>Experimental</td>
<td>80</td>
<td>72.38</td>
<td>3.513</td>
<td>78</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The tabulated T value at the level (0.05) for the degree of freedom (78) is equal to 1.

It is clear from the previous table that the calculated ($t$) value for the difference between the average scores of students in the experimental and control groups in the post-application of the performance attitudes test in financial accounting, which amounted to (25.601) and is significant at the significance level (0.05) with a degree of freedom (78). And the value of the Eta square ($\eta^2$) for testing performance attitudes in financial accounting is (0.89), and this is due to the use of the flipped learning strategy. Also, the value of “D” is equal to (5.69), which expresses a large effect size. Which indicates that there is a statistically significant difference between the average scores of students in the experimental and control groups.
in the post-application of the performance attitudes test in financial accounting. Which indicates acceptance of the first hypothesis of the research. It also answers the fourth question stated in the research problem, which is: What is the effectiveness of the flipped learning strategy in developing the accounting skills of second-year commercial secondary school students?

**Validating the second hypothesis of the research hypotheses**

Which states that there is a statistically significant difference at the level of (0.05) between the average scores of the students of the experimental and control groups in the post-application of the critical thinking skills test in favor of the average scores of the students of the experimental group.

To verify the validity of this hypothesis, T-values were calculated and their significance was calculated for the difference between the average scores of students in the experimental and control groups in the post-application of the critical thinking skills test. The following table shows this:

<table>
<thead>
<tr>
<th>Group</th>
<th>Students number (N)</th>
<th>Arithmetic Average</th>
<th>Standard deviation</th>
<th>Degrees of freedom</th>
<th>Calculated T value</th>
<th>Significance level</th>
<th>Eta square equation, D value</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>80</td>
<td>33.23</td>
<td>3.490</td>
<td>78</td>
<td>38.581</td>
<td>Significant at 0.05</td>
<td>0.95</td>
<td>8.72</td>
</tr>
<tr>
<td>Experimental</td>
<td>80</td>
<td>61.18</td>
<td>2.969</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The tabulated T value at the level (0.05) for the degree of freedom (78) is equal to 1.671.*

It is clear from the previous table that the value of (t) is significant at the level of (0.05), where it reached 38.581. The size of the effect was also high and significant. This means that there is a noticeable improvement in the level of students in the experimental group, and an increase in their abilities to think critically. The results indicate that The Ayatta square value ($\eta^2$) for testing critical thinking skills is (0.95), and this is due to the use of the flipped learning strategy. This is due to the use of the flipped learning strategy, and the value of (D) is equal to (8.72). It expresses a large effect size, which indicates that there is a statistically significant difference between the average scores of students in the experimental and control groups in the post-application of the critical thinking skills test. This is due to the use of the flipped learning strategy, and the value of (j) is equal to (8). It expresses a large effect size, which indicates that there is a statistically significant difference between the average scores of students in the experimental group in the post-application of the critical thinking skills test.

**Validating the third hypothesis of the research hypotheses**

Which states that there is a positive, statistically significant correlation between the scores of the experimental group students in the post-application test of performance attitudes in financial accounting and their scores on the test of critical thinking skills. To verify the validity of this hypothesis, the value of the Pearson correlation coefficient was
calculated between the students’ scores on the performance attitudes test in financial accounting and the critical thinking skills test, and the following table shows this.

<table>
<thead>
<tr>
<th>Table 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationship between the scores of the experimental group students in the post-application</td>
</tr>
<tr>
<td>Test</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Performance attitudes test in financial accounting - test of critical thinking skills.</td>
</tr>
</tbody>
</table>

It is clear from the previous table that there is a strong positive correlation between students’ scores on the performance attitudes test in financial accounting and their scores on the skills test. Critical thinking, as the value of the Pearson correlation coefficient reached (0.928), which is a function at the level of 0.05), and this is due to several reasons and justifications, starting with the compatibility between the list of accounting skills and the list of critical thinking skills, and then we find that developing accounting skills led to the development of critical thinking skills and increased the correlation between accounting skills and critical thinking skills.

Which indicates the acceptance of the third hypothesis of the research, and it also answers the sixth question that was mentioned in the research problem, which is what is the correlation between accounting skills and critical thinking skills for students in the second year of commercial secondary school?

INTERPRETING THE RESULTS

The research aimed to identify the effectiveness of the flipped learning strategy in developing the accounting skills and critical thinking of commercial technical secondary school students. The results showed the effectiveness of the flipped learning strategy in developing accounting skills and critical thinking skills for second year commercial secondary school students.

The effectiveness of the flipped learning strategy in developing accounting skills and critical thinking can be attributed to the following:

1. Good planning for implementing the content of the experimental units which is based on providing an active and effective educational environment suitable for the teaching and learning process. Flipped learning emphasizes the role of the teacher as a facilitator and planner for a flexible educational environment that helps the learner to have continuous dialogue, exchange ideas between students and ask questions.

2. Formulating the content of the experimental units in the form of educational videos, in addition to the ability to pause or play the video more than once, contributed to developing the learners’ skills, which helped them remember the information easily and conveniently.

3. Implementing educational activities inside the classroom with a variety of exercises for each lesson, which focus on developing accounting skills and critical thinking skills.

4. The nature of the flipped learning environment, as the implementation of activities and student interaction within the classroom contributed to increasing students’
engagement with the content, as each student, after watching the educational video, is required to write notes on it and do some activities related to the skill aspects of the content.

5. Investing class time using various teaching methods, such as cooperative and individual learning, helped increase learners’ motivation towards mastering accounting skills, which contributed to developing their critical thinking skills.

6. The positive interaction between the students and between them and the researcher, in an atmosphere of affection, helped the success of the strategy in achieving its goals.

7. Continuous evaluation, feedback, and continuous monitoring of the performance of the experimental group students made them more effective in the teaching and learning process.

8. The strategy creates an atmosphere in which learners feel safe and free to express their opinions, which increases interest, focus, and motivation to learn and participate in the educational process.

9. Teaching with flipped learning saves the teacher's time and effort, which gives him the opportunity to use some of this time to guide, follow up, and guide the learners and provide them with more assistance.

10. Incorporating critical thinking skills into the content of the strategy and the educational activities it included helped develop students’ critical thinking skills.

11. The flipped learning strategy helped organize learners' thoughts by watching video clips, recording notes and questions before the class, and then asking questions and holding discussions during the class.

12. Providing students with access to educational material in more than one way at any time and in any place, in addition to providing students with the opportunity to discuss and communicate with their peers and the teacher outside the classroom environment through the educational platform (Easy Class) or WhatsApp.

13. Providing technology and its services, such as office equipment, display equipment, and Internet service, and applying them both inside and outside the school has contributed to students gaining many experiences, improving their level of performance, and developing many of their skills.

DISCUSSION OF THE RESULTS

When compared to the summarised prior research, the results of the current study are generally in agreement with those of other studies, especially those by Astawa et al. [23] who aimed to determine if and how students' sense of agency and critical thinking skills may be improved through exposure to disaster map visualisation as part of a flipped classroom learning approach in the context of geography education, the study of Pardosi & Ming [24] examined how flipped learning instruction in a Chinese 'teaching with technology' course affects the growth of students' higher-order thinking skills (HOTS), Alkhawaldeh & Khasawneh [25] also compared the effectiveness of the conventional approach to teaching English to students who are blind or visually impaired with the more innovative approach of using cellphones to flip the classroom., José et al. [26] examined the flipped classroom as a pedagogical paradigm, with a special emphasis on how it encourages active learning in light of the current generation's preference for technological
and collaborative approaches to education, Shih & Tsai [29] attempted to find out how students felt about using the flipped classroom method to complete projects online for marketing research classes, and finally Lee [30] aimed to test out a flipped classroom model in a functional English course for undergraduates and to analyse its benefits and drawbacks. The results of these research show that the flipped classroom approach is effective in a variety of educational settings. In contrast to the encouraging results of the current study, Dusenbury & Olson [28] reported a preference for traditional lecture approaches. The current study adds to the growing body of evidence that implementing a flipped classroom model can have positive results; nevertheless, it appears that doing so is dependent on factors such as careful preparation, the use of appropriate technology, an engaging learning environment, and regular feedback. The results show that the flipped learning approach has promise, but that it must be implemented with caution, and that its efficacy may vary depending on context and field of study.

CONCLUSION

The purpose of this study was to test the hypothesis that second-year commercial high school students would benefit from a flipped learning approach to accounting and critical thinking. The findings offered substantial proof for the usefulness of the flipped approach to education. The results showed that the flipped learning group considerably outperformed the control group on post-tests measuring both accounting and critical thinking. Researchers concluded that the flipped learning model's success can be attributed in large part to the following factors: the creation of an interactive learning environment; the use of multimedia content (such as educational videos); the incorporation of a range of classroom exercises focused on skill development; the provision of a secure yet welcoming learning environment; the provision of regular opportunities for assessment and feedback; and the use of technology. As with the vast majority of the aforementioned studies, these results highlight the fact that the flipped classroom model can result in significant benefits for students when implemented carefully.

REFERENCES


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