Enhancing Learners' Performance: Exploring the Combined Impact of Web-Based Mathematics Self-Learning and Homework Resources on Classroom Test Scores

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***Abstract*—This study delves into innovative methods of learning mathematics beyond traditional classrooms, specifically focusing on web-based strategies that resonate with modern learners' inclination toward technology such as online videos and internet resources. The research's core objectives include identifying diverse self-directed learning approaches in mathematics beyond the classroom and evaluating their effectiveness in student performance. To achieve these goals, the study employs a methodology encompassing interviews with both mathematics learners and teachers, alongside the administration of a Google Forms questionnaire. Data analysis employs SPSS 23. The study's outcomes underscore a robust connection between the utilization of videos and achieving elevated scores in mathematics tests. In contrast, other resources like group work exhibit a negative correlation, albeit without statistical significance. This observation accentuates the significance of prudent resource utilization, as improper deployment can detrimentally affect student performance. The study's implications hold value for educators, suggesting the endorsement of video resources to learners, even in cases when video production proves challenging and digital learning platforms present limitations. By recommending engaging online resources like videos, this research contributes to elevating pedagogical practices, aligning with learners' preferences, and furnishing effective tools to bolster their educational journey.**

***Index Terms*—Mathematic learning, self learning, Information and Communication Technology (ICT)-online learning, mathematical skills, web-based methods**

I. Introduction

The acquisition of mathematics knowledge for learners remains a challenge for families and poses a significant challenge for nations worldwide. Each country strives to improve its performance in international mathematics competitions and effectively teach mathematics to its youth. Having mathematical skills enables individuals to adapt more easily to a technological environment, secure satisfying jobs, and enhance their quality of life. It also enhances their awareness of environmental issues and their ability to make clear decisions.

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Mathematical skills are crucial because they lead to numerous positive outcomes in education and daily life [1], including improved socioeconomic status, health, and employee well-being. They also provide access to STEM fields (Science, Technology, Engineering, and Mathematics) [2]. Mathematics is considered a fundamental requirement in education as it develops fundamental cognitive skills that are applicable to various related fields such as physics, chemistry, engineering, and banking. Furthermore, mathematics skills contribute to the development of human capital, which forms the foundation for technological advancement in a nation [3, 4].

Over the course of several decades, it has become evident that parental involvement and the family environment play significant roles in learners' education, including their mathematics education [5]. Learners early academic success depends on the development of their mathematical skills [6], and those who excel in mathematics are likely to excel in other areas in the future [7].

The effectiveness of web-based digital tools in improving learners' ability to ask questions has been the subject of numerous studies. The results have demonstrated the value of these digital tools in the learning context and the positive attitudes learners hold towards their use in the classroom [8]. Considering learners' needs and interests, Quadros-Flores *et al.* [9] examined how Information and Communication Technology (ICT) impacts the training of in-service instructors. The results showed that ICT was beneficial to education and aligned with learners' desires and interests.

The primary objective of this study is to examine the diverse methodologies employed by learners within a moderately sized, semi-urban social context for learning mathematics when they are not in classroom. The overarching aim is to evaluate the efficacy of each approach and pinpoint the most successful strategies. These methodologies encompass a range of practices such as utilizing online resources, engaging in collaborative study groups, seeking personalized tutoring, interacting with educational gamification, and more.

The investigation will particularly center on appraising the effectiveness of internet-based techniques, which are increasingly embraced by learners in their independent learning endeavors. This assessment will encompass a thorough analysis of the influence of online learning platforms, instructional videos, and other digital assets on learners' grasp and application of mathematical principles. By identifying the most advantageous and successful strategies for learners within a middle-class, semi-urban social context, this research will provide valuable insights into the realm of

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mathematics education beyond the traditional classroom setting. The findings will enhance pedagogical strategies by offering pragmatic guidance to educators, parents, and decision-makers on how to support learners in their pursuit of mathematical proficiency.

II. Literature Review

In recent years, advancements in technology have made online learning more accessible and given rise to a new method of learning. The internet and online learning platforms enable learners to access online learning environments, and to study at any time and from anywhere Online learning provides also greater flexibility in educational settings. Karatza [10] highlights the increasing presence of technology in learners' lives, with statistics showing that a significant portion of teenagers engage in video gaming [11].

Gabriel and Gilberto [12] explored the integration of interactive and engaging elements in online collaborative mathematics learning environments. Their findings indicated that when learners learn mathematics in such environments, which incorporate features like instant messaging, discussion forums, and multiplayer mathematics games, they develop a positive attitude towards learning.

HomeKay and Kletskin [13] developed instructional videos in the form of podcasts to assist learners in solving complex mathematical or scientific problems. Learners who regularly engage with these podcasts perceive them as effective learning tools that enhance their performance in calculus classes. Some interactive learning environments based on online videos also provide digital materials and notes [14]. Learners appreciate these interactive learning environments and demonstrate improved performance as a result of utilizing them.

The study by Li and Ma demonstrated that computer technologies have a positive and statistically significant impact on mathematics achievement [15]. These technologies provide learners with new opportunities by making knowledge more accessible and offering interactive tools for visualizing mathematical concepts. Popular search engines like Google and online encyclopedias such as Wikipedia, allow learners to quickly access up-to-date materials, complementing traditional textbooks. Moreover, digital applications and simulations play a significant role in enhancing the understanding of scientific concepts [16].

The study conducted by Cheung and Slavin emphasized the positive effects of educational technology on arithmetic test scores. Their research demonstrated that integrating technological tools and apps into mathematics instruction can yield positive outcomes [17]. These tools enable active learner engagement, deepen their understanding of mathematical ideas, and improve academic performance.

Recent research has focused on learners' attitudes toward the use of digital tools in the classroom. The findings indicate that learner attitudes vary, although some learners recognize the value of digital tools in enhancing their mathematical abilities [18]. Positive attitudes and behaviors among learners have been observed, highlighting the potential of digital tools to support arithmetic learning

Homework, defined as tasks assigned to learners by teachers that are completed outside of class, is a common and significant educational activity for learners [19].

Empirical findings on the relationship between homework and mathematical success have been mixed. Several studies have demonstrated a significant and positive correlation between homework and mathematics achievement. Areepattamanil and Kaur [20] found a positive correlation between the amount of time spent on homework and mathematics success, based on data from the National Longitudinal Study (NLS: 72), the High School and Beyond Study (HSB: 1980), and the National Longitudinal Education Survey (NELS: 1988).

Pelletier [21] examined 143 third-grade learners and found a strong correlation between successful mathematics performance and the completion of assignments, as well as accuracy in completing them. Similarly, Fernández-Alonso [22] found a positive relationship between the frequency of assignments, time spent on them, effort put forth, and mathematical success using data from 7451 second-year learners in Spain.

These studies suggest that completing homework assignments in mathematics can be associated with improved academic performance in the subject. However, it is important to note that the relationship between homework and mathematics success may vary based on individual factors and instructional practices.

While there have been studies indicating a positive correlation between homework and mathematics success, as mentioned earlier, there are also studies that have shown no relationship or even a negative relationship. For instance, Jong [23] found a negative correlation between the amount of time spent on homework and mathematics success among college learners in the Low Countries. Similarly, Kitsantas [24] reported a negative correlation between homework time and mathematics success based on data from the American PISA 2003 evaluator survey. It's worth noting that such studies, which have found a negative correlation, are rare. These contradictory findings could be attributed to multiple factors. One factor is the academic level of the learners being studied, as different grade levels may have varying effects of homework on academic success. The subject being studied is another factor to consider, as the relationship between homework and success may differ across different subjects. Additionally, the indicators used to measure academic performance can influence the outcomes of the studies [25].

It is important to recognize that the relationship between homework and mathematics success is complex and can be influenced by various contextual factors. The impact of homework may vary for different learners, and instructional practices, as well as the quality and relevance of the assignments, can also play a role. Therefore, it is crucial to consider a range of factors when interpreting the findings of studies on the relationship between homework and mathematics achievement.

According to Harris [26], incorporating mathematics into schools' family engagement programs may help reduce educational disparities over time. Researchers have hypothesized that linking learners' mathematics learning experiences to their home and school environments can be an effective way to enhance their academic success.

Studies have demonstrated that parental involvement in mathematics activities and discussions leads to better mathematics outcomes for learners, regardless of the family's income or education level [27, 28]

It is crucial for teachers and parents to provide learning opportunities that are tailored to each child's unique needs in order to enhance opportunities for every child, regardless of their circumstances [29].

III. The Circumstances of Self Learning

A. Self-Learning

To enhance the accessibility of online learning for learners, autonomous learning plays a crucial role, and self-regulation is a fundamental component of this process. Self-regulated learners actively engage in their learning journey by establishing task-oriented learning objectives, taking responsibility for their education, and monitoring their progress [30]. However, due to the potential for distractions and the significant challenge of maintaining personal discipline, learners often struggle to regulate their learning effectively in online environments [31].

One essential aspect of self-regulation is the learner's ability to establish their own learning objectives and employ strategies to achieve them [32].

Numerous studies have examined the relationship between academic performance and the utilization of self-regulated learning strategies, revealing that learners who excel academically tend to employ self-regulation more frequently [30].

However, several studies have also shed light on the challenges faced by many learners in effectively regulating their learning. Some learners encounter difficulties in initiating monitoring and controlling behaviors during the learning process, which can hinder their capacity to self-regulate effectively [33, 34].

Online learning is experiencing significant growth and has become a crucial method for regular instruction and education. However, it is vital to consider learner satisfaction when evaluating and enhancing online courses and educational programs across various institutions [35]. This satisfaction refers to the learner's achievement and positive experience with their online learning [36]. It correlates with key performance indicators such as learner academic success, dropout rates, and persistence [35, 37].

In contrast to traditional classroom learning, online learning places a greater emphasis on the learner. Particularly in asynchronous learning environments, learners assume more responsibility, autonomy, and self-regulation [38]

Several empirical studies indicate a positive association between learner satisfaction and self-regulation [39]. Co-regulated participants, in their own capacity, facilitate the exchange of information among individuals or groups by coordinating the self-regulation process through interactions with themselves [40].

In the context of online learning, when videos serve as the primary instructional format, learners have control over their learning experience both at the course level (e.g., when watching a video) and at the activity level (e.g., when pausing a video) [41]. This increased flexibility empowers learners to tailor their learning experience and adapt to their individual pace and preferences.

B. The Period of COVID-19

The extraordinary circumstances brought about by the COVID-19 pandemic have initiated a worldwide change in teaching and learning practices. Mathematical instruction has changed as a result of learner foyers being converted into classrooms [42]. In response to this, researchers have noted that mixed or hybrid learning models, particularly the flipped classroom approach, present opportunities for teachers and learners to rethink learning spaces, remove barriers between home and school, and make learning more accessible in various ways [43, 44].

Technology advancements have greatly facilitated online learning, leading to the emergence of a new form of instruction. This method gives learners the freedom to access online learning environments at any time and from any location. The vast array of educational materials and videos that are available to learners on online learning platforms enhances their learning experience. Online learning environments are frequently customized, allowing learners to manage their own time and follow the learning paths provided by these platforms. The authorized learners demonstrate active participation in their online learning while controlling their own learning path. Overall, online learning resources prove to be a practical and effective for learners, maximizing their time and enhancing their learning experience, both in face-to-face and online courses

Online courses are quickly expanding and becoming more popular due to its flexibility and convenience in terms of time and distance. Since the COVID-19 virus spread, online education has emerged as a very popular and secure alternative to traditional classroom instruction. However, compared to face-to-face courses, learners in online courses have fewer opportunities to interact directly with their teachers and classmates [45].

C. A Source of Motivation

One of the challenges faced by all stakeholders is increasing learners' participation in mathematics education. Although the importance and advantages of mathematical skills are widely recognized, many learners hesitate to enroll in mathematics courses due to past failures, which contributes to pressure and anxiety [46].

Based on the research conducted by Chi and Wylie [47], when learners exert more effort in their studies, they can develop a deeper understanding of the course material. Learner approach mathematics instruction with varying levels of success and motivation, and they develop different attitudes and affinities towards the subject.

Studies have shown that when guided learning strategies are used, the students are better able to absorb the learning content [48], achieve improved results, and experience increased motivation to learn [49], as well as greater confidence in setting learning objectives [50]. The findings of [51] demonstrated that the integration of guided learning strategies into online calculus courses can enhance learners' mathematical performance and personal efficacy.

Participation in online discussions by learners affects their satisfaction with the online learning experience, which is a crucial indicator for its assessment.

IV. Methodology

A. Procedure

In this study, a rigorous methodology was employed to collect information about the diverse strategies learners utilize to prepare for arithmetic outside the classroom. This methodology comprises several distinct stages, outlined as follows:

1) Engagements and Interviews with Stakeholders: Arrangements were made for sessions and individual discussions with a representative cross-section of stakeholders (learners, teachers, …) who exhibited interest. The aim was to amass data concerning their methods for mathematics self-study beyond the classroom, and to gain insights into their assessments of the efficacy of these methods.
2) Interactions with Educators: Additionally, interactions were held with mathematics instructors to elicit insights into the strategies they recommend to their students and to gain their viewpoints regarding extracurricular learning methods.
3) Examination of Learner Perspectives: An evaluation of learner perspectives concerning diverse learning techniques was undertaken, utilizing information obtained from interviews with both learners and educators. This analysis facilitated the identification of prevalent and well-received approaches among the participants.
4) Questionnaire Design: Informed by the insights derived from the perspective analysis, the questionnaires were formulated to quantitatively capture data concerning the utilization and effectiveness of various non-classroom learning strategies. To ensure the representativeness of the data, the questionnaires were administered to a broader spectrum of participants and educators.

B. Hypothesis

H1: Videos are the most commonly used by learners in their self-learning at home

H2: All web-based learning resources show a positive correlation with mathematics test scores.

C. Participants

In the southern Moroccan city of Ouarzazate, the questionnaire was given to learners at three different educational institutions. A total of 113 participants, randomly selected from a pool of 321 students, aged between 14 and 18, completed the questionnaire as part of this study. Google Forms was utilized to gather the data, and the survey link was distributed to participants via groups created by the students themselves on a messaging app.

The participants for this study were selected using a random sampling method to ensure representativeness and minimize potential biases in responses. This approach aimed to include a diverse range of learners from public educational institutions. By employing random selection, the study sought to achieve a more unbiased and well-rounded understanding of the various learning approaches used by learners in a semi-urban social context. This approach enhances the credibility of the research findings and provides a broader perspective on mathematics learning outside the traditional classroom environment.

The questionnaire had three main sections:

1) Personal data: This section aimed to gather demographic data such as gender, age, current academic standing, and the type of instruction received (public or private).
2) Questions about access to technological resources and Internet use: This section of the survey asked about a variety of topics, including participants' access to the Internet at home, their possession of computers and smartphones. The assessment was conducted using a Likert scale with values ranging from 1 (not important at all) to 5 (very important). Participants were asked to express their opinions regarding the importance of using the internet for doing mathematics homework at home, and significance they attributed to mathematics.
3) Methods for working on mathematical problems at home: The focus of this questionnaire section was on the various methods that participants used to prepare for math problems at home. The possibilities mentioned included using online videos, websites, social networking sites, books, doing individual work and working with other learners.

The test was divided into two sections, one on algebra and the other on geometry, with each section worth 10 points (for a total of 20 points). The test was administered at school under the supervision of mathematics teachers.

V. Results and Discussion

In the present study, a reliability analysis was conducted to assess the internal consistency of the measurement scale used. The Cronbach's Alpha coefficient was computed to evaluate the reliability of the scale, which consisted of 11 items. The obtained value of 0.895 indicates a high level of internal consistency among the items. According to conventional guidelines, a Cronbach's Alpha value exceeding 0.8 is considered to demonstrate strong reliability. Thus, the results of this analysis suggest that the data collected from the participants can be considered reliable for further investigation and interpretation.

A Cronbach's Alpha of 0.895 (Table I, Table II) indicates that the items within the scale are closely related and collectively measure the underlying construct with a high degree of consistency. This strengthens the confidence in the accuracy and dependability of the scale's measurements. Consequently, the findings derived from this scale can be deemed as trustworthy and suitable for drawing meaningful conclusions.

No incomplete information was retrieved from the 113 participants in our study's survey (53% of whom are female), who are mostly learners in public schools. To better understand the participant profiles, the central characteristics of the variables were calculated.

TABLE I: CASE PROCESSING SUMMARY

		N	Percent (%)
Cases	Valid	113	100.0
	Excluded[a]	0	0.0
	Total	113	100.0

Note: a: Listwise deletion based on all variables in the procedure.

TABLE II: RELIABILITY STATISTICS

Cronbach's Alpha	N of Items
0.895	11

The average age of the participants was 15.81 years old. It was the norm for people to be 15 years old. These findings point to a significant concentration of individuals in this age group. Regarding technologically related attributes, it was observed that 80% of the participants had internet access, while 93% of the participants utilized a phone, and 45% employed a computer. Regarding the educational aspect, participant perspectives were also assessed. The variable "importance of mathematics" exhibited a variance of 3.462, indicating varying viewpoints among participants on this subject. Likewise, the measure "utility of the Internet in the context of self-paced mathematics learning" displayed a variance of 2.181, implying differing evaluations of the Internet's value in their learning experiences.

The widespread use of technologies like Internet access, computers, and phones underlines the significance of incorporating technological tools into education. The differences in participant attitudes regarding the value of mathematics and the usefulness of the Internet highlight the range of viewpoints present in our survey.

This section focuses on investigating the strategies used by learners to incorporate the Internet into their at-home mathematics learning process. Before introducing the results, a delineation of the employed self learning methods along with their respective descriptions is provided below: **Books**: Students utilize hardcopy books containing solved exercises in mathematics. **Parents**: Learners depend on parental guidance to aid their preparation. **Websites**: Students employ internet platforms to present their challenges and obtain responses. **Social Media**: Groups and pages provide educational support to mathematics learners. **Individual work**: Learners build upon classroom learning through self-directed study and home revision. **Group**: Students engage in peer discussions regarding their challenges using digital communication methods. **Videos online**: Students rely on videos uploaded by teachers from diverse regions to navigate through learning challenges. **Other:** when learners state that they use a method not mentioned among the previous choices. The output of SPSS is provided in Table III.

TABLE III: THE DISTRIBUTION OF DIFFERENT SELF-LEARNING METHODS

Self Learning Methods		Responses		Percent of Students
		N	Percent	
$method[a]	Videos Online	75	36.2%	66.4%
	Social Media	18	8.7%	15.9%
	WebSites	19	9.2%	16.8%
	Individual work	23	11.1%	20.4%
	Group work	16	7.7%	14.2%
	Parents	12	5.8%	10.6%
	Book	25	12.1%	22.1%
	Other	19	9.2%	16.8%
Total		207	100.0%	183.2%

Note: a: Dichotomy group tabulated at value 1.

The results shown here are based on participant responses to multiple-choice questions. We'll examine the frequency of use of various self-learning techniques, including books, social media, individual learning, group work with other learners, online videos, and other techniques as shown in Fig. 1.

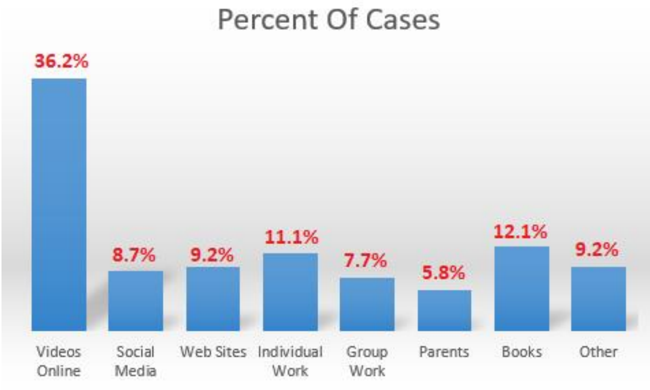

Fig. 1. Frequency of use of various self-learning techniques.

Based on the 113 participants, 207 responses, the following distribution of responses was made: **Online videos**: 75 participants (66.4%) reported using Online videos as a home-based "auto-learning" method for mathematics. This method was the most popular among the participants, accounting for 36.2% of all cases. **Social media**: 18 participants (15.9%) reported using social networks for their home mathematics studies (groups and pages), which accounts for 8.7% of cases. **Websites**: 19 participants (16.8%)—representing 9.2% of cases—mentioned using online learning resources to learn mathematics at home. **Individual work**: 23 participants (20%) chose this option, which accounted for 11% of cases. **Group work**: 16 participants (14.2%) chose to work in groups for them at-home mathematics preparation, which accounted for 7.7% of the cases. **Parental assistance**: 12 participants (10.6%) reported receiving parental assistance, which accounts for 5.8% of cases. **Books**: 25 participants (22.1%) mentioned using books for them at-home mathematics education, which accounted for 12.1% of cases. **Additional methods**: 19 individuals (16.8%) mentioned additional "auto-learning" methods, accounting for 9.2% of cases.

According to the results of our study, Online videos are the most popular way for students to use the internet to prepare their math homework at home. This tendency can be attributed to the availability and accessibility of online video resources as well as to the visual learning potential that these resources provide.

Table III highlights the variety of learning preferences among learners, with some preferring to work independently while others prioritize teamwork with their partners.

The correlation between the scores and the method used. The findings show a significant correlation between the variables "Score" and "Online videos": **Pearson Correlation**: The Pearson correlation measures the strength and direction of the linear relationship between the variables; **Sig. (2-tailed)**: The value of p associated with the correlation indicates the correlations' statistical significance. The analysis of the correlation table (Table IV) provides valuable insights into the relationship between various strategies used by students for mathematics homework preparation and their resulting scores. The dataset, consisting of 113 participants, offers a glimpse into the effectiveness of these strategies in influencing academic performance.

TABLE IV: CORRELATION BETWEEN TEST SCORES AND THE USE OF SELF-LEARNING METHOD

Method		Score
Online videos	Pearson Correlation	0.686**
	Sig. (2-tailed)	0.000
	N	113
Social Media	Pearson Correlation	0.053
	Sig. (2-tailed)	0.577
	N	113
Sites	Pearson Correlation	0.022
	Sig. (2-tailed)	0.820
	N	113
Individual work	Pearson Correlation	−0.140
	Sig. (2-tailed)	0.140
	N	113
Group work	Pearson Correlation	−0.021
	Sig. (2-tailed)	0.827
	N	113
Parents	Pearson Correlation	−0.301**
	Sig. (2-tailed)	0.001
	N	113
Book	Pearson Correlation	−0.046
	Sig. (2-tailed)	0.631
	N	113
Other	Pearson Correlation	−0.179
	Sig. (2-tailed)	0.059
	N	113

Note: **: Correlation is significant at the 0.01 level

Online video usage stands out with a significant positive correlation (r = 0.686, p = 0.0000) with mathematics scores. This finding suggests that students who frequently engage with online videos as part of their preparation process tend to achieve higher scores. The moderate strength of the correlation indicates that there is a meaningful association between this strategy and improved performance. This aligns with the contemporary trend of incorporating multimedia resources into learning, allowing students to visualize complex concepts and engage with materials in different ways.

Contrary to expectations, social media engagement exhibited a weak positive correlation (r = 0.053) that lacked statistical significance (p = 0.577) with mathematics scores. This indicates that using social media platforms for homework preparation may not significantly impact academic performance in this context. However, it's important to consider that social media might not be primarily intended for educational purposes, and distractions or superficial interactions on these platforms could explain this lack of meaningful correlation.

Interestingly, parental involvement demonstrated a substantial negative correlation (r = −0.301, p = 0.001) with mathematics scores. This finding challenges the common belief that greater parental engagement directly leads to improved academic outcomes. It's worth considering that excessive parental involvement might inadvertently hinder a student's independent learning and problem-solving skills, thereby affecting their performance. This result suggests that a delicate balance between guidance and allowing students to tackle assignments on their own might be more conducive to learning.

The other strategies, such as individual work, group work, book usage, and other unidentified methods, displayed negligible correlations or lacked statistical significance. These findings imply that these strategies might not have a strong influence on mathematics scores in the context of homework preparation. It's essential to recognize that the effectiveness of these strategies can vary based on individual preferences, learning styles, and the nature of the subject matter.

In summary, H1 is accepted because the correlation table highlights the significance of online video usage as an effective strategy for mathematics homework preparation, emphasizing the potential benefits of multimedia resources in enhancing student understanding and engagement. H2 is rejected because Social Media and Websites did not have a statistically significant correlation.

The unexpected negative correlation between parental involvement and mathematics scores underscores the need for a nuanced approach to parental guidance. The study's limitations include its focus on a specific dataset and the possibility of confounding variables not considered in the analysis. Further research could delve deeper into the underlying mechanisms of these correlations and explore the broader implications for education in a digitally evolving landscape.

The summary of correlation results, as generated by SPSS, is provided in Table IV.

During the interviews with learners, we were able to identify the various methods employed by the majority of learners and understand their difficulties in learning mathematics.

The learners also stated a preference for watching instructional videos as they provide the opportunity to review the lessons multiple times, regardless of time and location.

Most learners hope that their teachers will produce videos and digital resources that meet their needs. However, this challenge is confronted by the practices and skills of the majority of the interviewed teachers. The teachers declare that they require relevant training on the use of new technologies in education, as well as the provision of necessary materials and conditions to address the learners'needs.

VI. CONCLUSION

This study explores the effectiveness of web-based self-learning strategies in mathematics education outside classrooms. The research focuses on the impact of online videos and digital resources on learners' performance. The study's findings shed light on the potential advantages of leveraging the internet to enhance the efficacy of self-paced mathematics learning, particularly in terms of flexibility and the availability of resources. In instances where implementing approaches such as flipped classrooms might pose challenges, it has been observed that many learners gravitate towards utilizing Online videos to enhance their comprehension.

Findings suggest that learners gravitate towards online videos, leading to enhanced comprehension and engagement. Educators are advised to integrate tailored video content into their teaching methods, and institutions could benefit from a blended learning approach that combines in-person instruction with digital resources. The study's implications extend to policy makers, curriculum designers, researchers, and technology providers, shaping educational practices and enhancing the role of technology in fostering independent learning.

Given this context, it is advisable for educators to create videos that are specifically tailored to their learners' needs and preferences, and to distribute them on platforms that are commonly used by the learners themselves. Furthermore, teachers are encouraged to recommend reputable videos and channels to their students, guiding them towards high-quality educational content.

These recommendations are aimed at fully harnessing the potential of online resources, providing learners with enriching opportunities for independent learning, even when access to conventional educational materials may be restricted.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Najim Oumelaid conducted the statistical analysis. Najim Oumelaid and Faouzi El-Mrabte, both mathematics teachers, collected the data and drafted the article. Brahim El-Boukari proposed the methodological aspects and provided overall supervision. Jalila Elghordaf, as a professor at the Mathematics Education Training Center for Future Teachers, provided assistance and guidance in the development of this article. All authors have also approved the final version of this article.

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