Fundamentals of e-learning in mathematics teaching: future perspectives

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Abstract.
Technology in education has changed math instruction, with e-learning being one of the biggest changes. This article examines the origins of e-learning in mathematics education and its future applications. In recent years, e-learning has become a key part of modern mathematics education, helping pupils study, focus, and become proficient. Recently, e-learning has become vital to mathematical education. By giving students interactive mathematical material, educators may make the classroom more engaging. This enables educators to accommodate different learning styles and make the classroom more entertaining for everyone. Thus, employing a range of e-learning tools in mathematics classes may boost student learning. Future math education in regular classrooms is likely to utilize more e-learning. Artificial intelligence, virtual reality, and student analytics may improve math instruction and personalize it. Hybrid and online learning methods like remote education may also make mathematics education more accessible. Math education has changed significantly due to e-learning technologies and technological advances. These improvements caused these modifications. E-learning's importance as a way to make mathematics instruction more productive and enjoyable has expanded in recent years. Artificial intelligence, virtual reality, and student analytics will likely play a larger role in spreading mathematical knowledge in the near future. Thus, pupils' mathematical skills will increase and their teaching will be more personalized. Due to online and hybrid teaching methods, more individuals can learn arithmetic. Future mathematics instruction will be more effective and efficient owing to modern technology.

Keywords:
mathematics teaching
e-learning
technological development
mathematics teaching technology
personalized learning
It is a structured learning experience conducted digitally, usually online. It can be accessed from any computer, tablet or smartphone, so students always have the opportunity to learn wherever they are.

A learning management system (LMS) is often used when managing e-learning courses. Training events in companies, self-continuing courses and various learning programs are managed through e-learning. It provides automation instead of detailed and expensive manual work, saves time and allows you to organize your content.

**History of E-Learning**

What is e-Learning and how does it currently benefit organizations? To understand this, it is necessary to examine the history of e-learning.

Elliot Maisie, who coined the term e-learning, used this expression professionally for the first time in 1999. Since then, the concept of e-learning has become increasingly widespread. There are some factors that have facilitated eLearning to become a popular way of delivering education today.

**Internet:** Before the Internet, most people learned and educated via books, CD-ROMs, and other ways. Internet access has allowed companies to ditch old methods and embrace eLearning.

**Multimedia Development:** As e-Learning has grown, pictures, movies, music, and graphics have attracted students more than conventional learning. As digital gadgets grow cheaper, eLearning is becoming increasingly popular. E-learning has grown rapidly with mobile learning [1].

Learning management systems have gotten increasingly sophisticated since moving from local to cloud-based. Many organizations are using them to operate training systems. An LMS's features and support should help you and your students achieve your objectives. Make sure you check this [5, p.155].

**Asynchronous and Synchronous E-Learning**

In the asynchronous type of e-learning, students take courses at their own pace and progress at their own pace. Individuals can access training programs instantly and receive training from any location as long as they have access
Asynchronous e-learning courses include [1]:
1. Tutorial articles
2. Exams
3. Simulation trials

Synchronous e-learning courses, also called virtual
instructor-led training, are delivered entirely online, with
participants interacting with other students at the same time. This
learning method is right for people who prefer an
instructor-led and collaborative learning experience.

Synchronous e-learning often includes live platforms and
activities such as:
1. Online seminars
2. Virtual classes
3. Online chat
4. Live debates
These tools allow users to interact in real time.

Advantages of E-Learning
It is affordable and saves time:
Since e-learning can be accessed mostly from anywhere, it
eliminates travel expenses and any expenses associated with
running a learning institute.

Students have the ability to learn at any time and
anywhere:
Due to the fact that e-learning can be accessed from any
location, it is no longer necessary for education to take
place only in traditional settings such as schools or even
private homes.

Students are able to make greater gains in their learning
by using apps and online learning platforms since they allow
them to continue the learning process whenever it is
convenient for them.

It is simple to monitor the progress:
Students are able to monitor their own progress using the
majority of applications and Learning Management Systems
(LMS), which keeps them motivated since they can go back and
see how far they have come in their studies.

In addition, teachers are able to monitor how well their
pupils are doing and determine whether or not any of them
want more assistance.

A kind of education that emphasizes using one's common sense:

E-learning includes interactive activities that guarantee a full grasp of each module, and it allows everyone to study the topic at their own speed, which may not be something that everyone enjoys doing in a big group setting.

**Types of E-Learning**

Every person uses E-learning for different reasons. While some want to develop new skills, others want to receive various distance training. E-Learning offers tremendous convenience and accessibility. Now we are going to look at the four different kinds of eLearning training that it is.

1. **E-Learning for Employee Training**

   E-learning for employees is the sort of e-learning that is utilized the most often. This style of learning is used by companies in the process of educating existing staff members, recruiting new staff members, and enhancing employee performance.

   When you teach your staff by utilizing a learning management system (LMS), the training becomes more effective and more formal. E-learning encourages knowledge growth and facilitates more efficient professional development as compared to more conventional forms of education. In addition, due to LMS, you are able to generate quizzes to increase training performance and continually analyze how well it is going.

2. **Instruction in Compliance Procedures**

   Training in compliance is an absolute need for any company. You have a responsibility to educate your workers about the rules that govern the organization as well as the responsibilities that they play there. Therefore, compliance training is required, and it should thoroughly cover a variety of problems that may arise in the workplace.

   In order to ensure the seamless management of the training program, you need to limit the risk of non-compliance. When you provide a more secure and productive atmosphere for your workers to work in, they will be able to enjoy those benefits as well. They will also find it simpler to keep up with the ever-changing requirements as well as the resources that you use for training [4, p.20].
3. Instruction of the Customers

It's possible that the concept of teaching your clients might seem appealing to you, but it really offers a lot of worth. Through the usage of customer education programs, you may assist your clients in using and comprehending your products and services. These trainings are particularly well received by those who deliver software. Education of the customer not only enhances the overall experience of the customer but also has an effect on the businesses that handle the customers. You will see an increase in the number of clients you have, as well as an increase in the level of engagement they have with your goods or services [1].

4. Training for Partners

Partner training, which is also often referred to as reseller training, provides your partners with the skills they need to work together more effectively. Training such as product knowledge training, sales training, support training, and marketing coaching are all included in this category. In most cases, one must get a certification before becoming a partner. Partner training provides a multitude of advantages, including the ability to engage with partners, a reduction in support expenses, and the protection of your brand.

Examination of Teacher Experiences Regarding Mathematics Lessons Delivered via Distance Education

In this research, we will compile and examine the analyzes made by "Batdal Karaduman, G., Akşak Ertaş, Z., & Duran Baytar, S. in 2021 on "Examination of Teacher Experiences on Mathematics Lessons Conducted via Distance Education".

The aforementioned text provides an explanation of the primary aspects of a research study as well as the participants that make up the study group. Although more context is required to understand why it is referenced in the text in question, the following are the primary reasons why it is cited:

Objectives of the Research The primary objective of this research is to investigate the classroom instructors' assessments of the mathematics lessons they instructed their students in while they were participating in the distance education process. As a result, the working group was formed specifically for this objective.
Approach of the Research: This study was carried out using an interpretative qualitative research approach. The purpose of this kind of study is to get an understanding of the experiences and meanings of the participants.

Sampling in an Easily Accessible setting: In order to expedite the research process and make it more applicable in real life, the study group was chosen using a methodology that included sampling in an easily accessible setting. Because of this, it is much simpler for researchers to get in touch with instructors who are eager to take part in the study.

Information Descriptive of the Working Group The working group is characterized by information descriptive of its members, such as their gender, the number of years of experience they have, and the province in which they operate. This information is supplied so that the features of the study group, as well as its makeup, may be comprehended.

Because of these factors, the text provides an explanation of the objectives of the study, as well as its methodology and the participants who made up the research group. These aspects of the research serve as the study's foundational pillars and provide the reader with information on the subject matter of the study as well as those who are relevant to it.

Data Collection Tool

In the study, a questionnaire was employed that consisted of open-ended questions in order to get a better understanding of the circumstances surrounding the mathematics course experiences of classroom instructors while they were participating in the process of distance education. During the process of designing the questionnaire for the survey, the first step was to do a literature search on the topic. Following that, a questionnaire with 10 open-ended questions was written. Two professionals in the relevant area looked over the survey form that was designed by the researchers. The measuring instrument was given its final form after the required adjustments were performed, which were determined to be essential as a result of expert reviews. Examples of questions may be seen below [2, page 4]:

- In your view, which features of the mathematics classes that were offered via remote education were the most
beneficial, and why?

- How do you assess the present situation when you compare the mathematics studies you carry out during the regular education processes with the mathematics lessons you carry out when you are enrolled in a program that offers online education?

- If you were given the task of defining the methodology behind the delivery of mathematics classes via the medium of distance education in a single phrase, which of the following would you choose?

- As a consequence of your experiences with mathematics courses that were delivered via the medium of distance education, what recommendations would you offer about the research that may be carried out?

Email was used to distribute the questions that had been created in advance to the instructors. Participants who responded to the questions sent their responses to the researchers who were conducting the study.

The Examination of the Data

The content analysis approach was used to examine the data that was gathered using the data collecting instrument that was utilized in the research. This tool consisted of open-ended questions that were designed to disclose classroom instructors' comments on the mathematics lessons that they presented while the students were participating in the process of distance education. The inductive methodology was used to the analyses that were performed using the coding system [3, p.14]. This methodology entails uncovering patterns, themes, and categories in the data via the process of coding.

In order to guarantee the accuracy of the findings, the results of the study carried out separately by two different researchers were compared, any inconsistencies were ironed out, and the categories were given their definitive shape. Again, within the limits of the reliability of the analysis, direct quotes were produced taking into consideration the criteria of striking, explanatory, diverse, and extreme instances. This was done in order to ensure that the analysis was accurate. In order to make the quotes easier to grasp, classroom instructors were given the codes O1 and O2 respectively. In addition, the first letter of the state or
province in which the instructor resides and works was added to the beginning of each code.

**The Findings**

The findings of the analysis of the classroom instructors' responses to semi-structured interview questions on their experiences in mathematics classes given via distance education are reported in this section as part of the parameters of the study topic. In this context, first and foremost, Table 1 presents the data on the contribution of mathematics lessons delivered by classroom instructors to students via remote education. These lessons were provided via a distance education program.

<table>
<thead>
<tr>
<th>Situation</th>
<th>Number</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contributed</td>
<td>19</td>
<td>50%</td>
</tr>
<tr>
<td>Did not contribute</td>
<td>10</td>
<td>26.3%</td>
</tr>
<tr>
<td>Partially contributed</td>
<td>9</td>
<td>23.6%</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: [2, p.6]

Based on interviews with educators who work in traditional classroom settings, the purpose of this section is to assess the contribution that mathematical studies make to the educational experience of students who participate in the process of distant education. In addition, a variety of phrases and viewpoints held by instructors are provided, as well as a summary of these ideas.

In addition to this, the viewpoints of educators hailing from a variety of provinces were carefully considered. For instance, it was reported that there were comparable positive comments in the data collected from the provinces of Istanbul and Van, despite the fact that statements suggesting that the contribution was large were discovered in the data obtained from the province of Edirne. In the meantime, it was discovered that the majority of teachers in the province of Van claimed that they had made no contribution, and they provided justification for their statements by citing factors such as the inability of students to use computers, the fact
that students who live in rural areas do not have access to
the internet, and the fact that parents who work in rural
areas are unable to devote sufficient time to their children.

In conclusion, Table 2 presents the perspectives of
mathematics educators who work in conventional classroom
settings about a comparison of courses provided via distance
education to courses taught in traditional classroom
settings. This was used to acquire an idea of how teachers
evaluated the relative qualities of face-to-face and remote
education, as well as how they balanced the pros and downsides
of each method to educating students. This was done using
this information. This chapter strengthens the meat of the
research and gives extra context for the results by making
the educators' ideas and evaluations available to the reader.
Additionally, this chapter provides additional context for
the findings.

**Table 2**

<table>
<thead>
<tr>
<th>View</th>
<th>Number</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote education cannot replace regular</td>
<td>28</td>
<td>73.6%</td>
</tr>
<tr>
<td>education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote education is somewhat beneficial</td>
<td>10</td>
<td>26.3%</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: [2, p.6]

This part conducts an analysis of the data to evaluate,
from the points of view of educators who operate in
conventional classroom settings, the similarities and
contrasts between education obtained face-to-face and
education acquired via remote learning, as well as the
contributions made by each. More than two thirds of classroom
teachers, according to the data, are of the view that
mathematics courses that are offered via online education
cannot totally replace mathematics classes that are taught by
face-to-face education.

While this is going on, there are some educators who are
asserting that the mathematics training that is provided all
along the process of remote education is useful, but not as
beneficial as education that is provided face-to-face. These
different viewpoints are reflective of how a large number of educators see the process of teaching mathematics to students via the medium of distance education.

The information gleaned from the provinces of Istanbul, Edirne, and Van is brought to the forefront at various points in the narrative. However, it should be mentioned that these assertions do not mean that distant education is as useful as face-to-face education. It has been stated that in the statistics of the Istanbul province, claims indicating remote education is favorable have been detected. On the other hand, it has been stated that the majority of people in the provinces of Edirne and Van think that education gained via distance learning cannot completely replace education received face-to-face. This is the opinion of the majority of people in both of these provinces.

The findings on the positive and negative aspects of taking mathematics courses online are outlined in the last table, which bears the heading "Table 3." It provides the reader with the opinions and evaluations of instructors, in addition to examining, in more detail, how the impact of distant education on the teaching of mathematics may be seen in the classroom.

### Table 3
Evaluation of the positive and negative aspects of mathematics courses given via distance education

<table>
<thead>
<tr>
<th>Positive Aspects</th>
<th>Number</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensuring students stay engaged</td>
<td>10</td>
<td>26.3%</td>
</tr>
<tr>
<td>Abundance of topic reviews</td>
<td>6</td>
<td>15.7%</td>
</tr>
<tr>
<td>Abundance of activities/examples</td>
<td>6</td>
<td>15.7%</td>
</tr>
<tr>
<td>Parental involvement in the process</td>
<td>5</td>
<td>13.1%</td>
</tr>
<tr>
<td>Use of different teaching techniques</td>
<td>3</td>
<td>7.8%</td>
</tr>
<tr>
<td>Providing motivation</td>
<td>3</td>
<td>7.8%</td>
</tr>
<tr>
<td>Differentiating learning styles</td>
<td>2</td>
<td>5.2%</td>
</tr>
<tr>
<td>Enhancing focus</td>
<td>2</td>
<td>5.2%</td>
</tr>
<tr>
<td>Time-saving</td>
<td>1</td>
<td>2.6%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>38</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

### Negative Aspects:
In summary, the following are some of the positive and negative aspects of obtaining an education via distance learning: According to the participating instructors, there are advantages and disadvantages to taking mathematics classes online or via other forms of distant education. The children are not emotionally divorced from the process, there is an abundance of topic repetitions, there is an abundance of activity/example sharing, the engagement of parents in the process, and there is the opportunity to use a variety of various expression styles. These are some of the good qualities of the program. Negative aspects include difficulties such as not being able to receive feedback from students, not being able to reach every student, a lack of mutual interaction, inadequate use of teaching materials, not being able to fully explain the topics that require practice, technical problems experienced by students, limitations in measurement and evaluation, decreased attention span, and a lack of support from parents. Positive aspects include not being able to receive feedback from students and not being able to reach every student.

Suggestions: Based on their own personal experiences, teachers provided a variety of recommendations to their fellow educators. In particular in the provinces of Istanbul and Van, there has been an increase in the number of ideas about
the preparation of classes and the teaching of subjects. According to the findings from the province of Edirne, a greater focus is made on providing pupils with feedback and making ideas to address flaws. In addition, there are recommendations for repeating the subjects that will be discussed after face-to-face instruction has begun in order to make up for the weaknesses that have been identified.

The purpose of this chapter is to offer an awareness of the benefits and difficulties associated with the process of distant education by presenting the experiences of instructors in the field of distance education, as well as the information and advice they received from these experiences. In addition to this, he emphasizes the fact that varied emphases are placed on certain topics based on the experiences of educators from other regions.

CONCLUSION

To begin, we will discuss the tremendous impact that technology has had on the classroom instruction of mathematics. In particular, we will focus on the role that e-learning has played as a primary factor in the overall enhancement of the quality of the educational experience. This part presents a summary of the most significant themes discussed in the article, such as the advantages of e-learning and the potential applications of technology in the field of mathematics education in the future.

The First Steps Towards an Online Education:

In this article, the history of e-learning is briefly covered, with a focus given on the influence that the Internet, different types of multimedia, and inexpensive digital devices have had in the broad adoption of e-learning. This shows the versatility that is provided by online education, in addition to the convenience that it offers.

Asynchronous and synchronous learning both have a place in the world of e-learning.

The two most common kinds of online education, synchronous and asynchronous learning, are broken down into finer points throughout this article. Asynchronous online learning allows students to go forward at their own pace, while synchronous online learning encourages participants to communicate information in real time with one another. Both of these
approaches could be useful in their own particular ways.

The Many Advantages of E-Learning:

The article presents a rundown of the benefits of e-learning, some of which involve the ability to track progression, cost-efficiency, and adaptability. E-learning is being touted as a method to education that is not just hands-on but also interactive, and it can be adapted to fit the requirements of different kinds of students.

There are several different kinds of online learning:

In this presentation, we will discuss the four major types of e-learning, which are staff training, compliance training, consumer education, and partner training accordingly. Each kind is responsible for a unique set of responsibilities when used in a range of educational contexts.

Regarding the Provision of Mathematical Instruction Via Distant Education: An Investigation into the Perceptions and Practices of Mathematics Educators:

This section offers a summary of a single research study that was carried out under the title "Examination of Teacher Experiences on Mathematics Lessons Conducted via Distance Education." The study was titled "Examination of Teacher Experiences on Mathematics Lessons Conducted via Distance Education." The purpose of the research, its methodology, and the participants who made up the group are all described in this section, which contributes context to the inquiry.

Performing Analysis and Carrying Out Data Collection:

The technique of collecting data, which consists of answering open-ended questions on a questionnaire, is covered in the article. This approach is used to gather the data. The data were subjected to a content analysis, and then an inductive approach was utilized to establish patterns and groups based on the outcomes of that study.

The Final Result Is as Follows:

The findings about the contributions that distance education has made to students are displayed in the results section, along with the viewpoints of instructors regarding whether or not they feel that it can completely replace traditional face-to-face education. In addition to this, it explores the many aspects, both positive and negative, of taking mathematics courses via a program that offers distance
education.

Some things to think about:

The conclusion of the article consists of some suggestions that teachers and professors have made based on their own professional experiences. These recommendations vary not just from one geographical location to another but also from one group of educators to another due to the unique histories and experiences each group brings to the table. There are many repeating themes throughout the course, including the preparation of the course, the transmission of feedback to students, and the rectification of problems.

This article draws attention to the potential for more integration of technology, such as artificial intelligence and virtual reality, as a means of concluding that e-learning is relevant in the area of mathematics education and that there is room for further integration of technology in general. It acknowledges the possibility that traditional methods of instruction may still play a part in education and that online education, despite the many advantages it offers, may not be able to totally replace such methods. The article provides insightful observations on the current condition of mathematics education and offers suggestions for how to make it better.

References:


