Challenges in Facilitating Online Teaching for Secondary Education during the Covid-19 Pandemic, based on a case study in Sri Lanka.

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Research Article

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Abstract

This research aims to evaluate the challenges in facilitating online teaching for secondary education during the Covid-19 pandemic based on a case study in the western province of Sri Lanka. With the pandemic, teachers had to face many challenges concerning online teaching, as they were unprepared for the remote teaching process that was to follow. For this research, teachers were able to give an account of their experiences, challenges, and the sacrifices that had to be made in adapting to this new method of teaching. A mixed method of data collection and analysis was used in this research, as both quantitative and qualitative methods in combination would provide a better understanding of the research problem enhancing the validity of the results. Through the findings of this research, it was revealed that most schools and their teachers had embraced online teaching amid the many challenges during Covid-19. Thereby measures had to be taken to overcome and mitigate the effects of these challenges faced in online teaching, making it possible for teachers to deliver an online education for students that is on par with other technologically advanced education systems.

Introduction

The use of technology in teaching has led to a paradigm shift in the entire education system. Contemporary education involving technology supports a more technologically driven, more flexible, and more learner-centered teaching environment.[1] This has made way for online teaching which enabled teachers to research students on a digital platform. The online teaching process is comprised of academic, technical and, administrative components thereby it was mandatory that the online teaching environment include these components to accomplish the effective execution of online education. In the wake of the global pandemic, Covid-19 education methods had to change drastically. Educational reforms were brought in immediately so that transition and a smooth flow in education could take place. Online teaching took a center stage in the education system but the challenges facilitating in one teaching were many, therefor this study intends to determine the challenges in facilitating online teaching for secondary education during the Covid-19 pandemic.

The education system was not equipped to face a change of this magnitude, as a fully digitized education system had not been tried out before. The challenges faced in online teaching were common to all but the impact of it was mostly felt by developing nations where technological methods of teaching were not commonly practiced. [2] In Sri Lanka, digitized education was at its inception at the start of the pandemic but within a short period, a rapid change took place in the education system as teachers took the challenge of switching from conventional teaching to digitized teaching. With the unexpected digital transformation in education, it was clear that teachers had no time for preparation; they had to depend on the devices and the technical skill they already possessed. Affordability and accessibility to teaching resources were said to be inadequate and challenging as teachers come from various socioeconomic backgrounds. [3] Limited funds were allocated by authorities for this process thereby the online teaching expenditure was selflessly born by teachers. There was teacher resistance to change as technological
integration and change in work patterns in teaching created tension. [4] The direct human contact and interaction the teacher had with the students were not felt in distance learning thereby it created a barrier between the student and the teacher. In addition, online teaching was quite an isolating process for the teachers, as they did not have the required support of the community or colleagues. A robust IT infrastructure had not been available in the field of education to face this crisis thereby teachers had to make do with the resources they already had.

Many were the challengers in facilitating online teaching for secondary education during the Covid-19 pandemic yet it was evident that regardless of all challenges faced, teachers, had found ways and means to continue with the online teaching process. [5] Despite all the resistance and the drawbacks, it is an obvious fact that online teaching continued solely because of the ability teachers possessed to adapt to the situation and the passion they had for teaching. This research intends to identify challenges in facilitating online teaching for secondary school during the covid-19 pandemic in order to find solutions for challenges so that a smooth flow in online teaching could take place. In finding, these gaps a mixed method of data collection and analysis would be utilized which would provide a comprehensive understanding of the challenges faced by secondary school teachers in online teaching during the Covid-19 pandemic. The future of successful online teaching would determine how successful we are in overcoming the challenges faced by teachers in online teaching.

The Aim and Objectives of the Study

The aims and objectives of this research would enable the establishment of the space the depth and the path the research would take. The aim of this research indicates what needs to be achieved, and objectives indicate how it would be achieved.
To investigate the challenges faced by school teachers in facilitating online teaching during the Covid-19 pandemic by assessing the challenging experiences teachers faced during online teaching.

**Main Objective**

To identify challenges in facilitating online teaching for secondary education during the Covid-19 Pandemic.

**Sub Objectives**

a) Develop an initial conceptual model on the challenges faced by teachers during the Covid-19 pandemic

b) Validate the initial conceptual framework using qualitative and quantitative data collected from teachers and experts in the field.

**Research Question**

What are the challenges in facilitating online teaching for secondary education during the Covid-19 pandemic?
Research Hypothesis

Hypothesis # 1: Motivation, which would have a positive impact on teachers who engaged in online teaching during Covid-19.

Hypothesis # 2: The lack of proper IT Infrastructure would have a negative impact on teachers who engage in online teaching during Covid-19.

Hypothesis # 3: There is a relationship between time management and the increased workload in online teaching during Covid-19.

Literature Review

This review of literature examines the challenges faced in online teaching, especially during the Covid-19 pandemic. Since it was a global pandemic, the challenges encountered in online teaching were common to all teachers across the globe. The literature reviewed was organized according to common themes, which provided insight and indicated its relation to the research topic. The final outcome of the literature review was mapped out in a conceptual framework.

The Impact of Covid-19 on Education

With the development of Covid-19, the closure of schools took place within a short span of time, in keeping with the newly imposed health regulations. This situation was able to break new ground in the field of education. The upgrading of its mode of delivery, focusing its attention more on emerging technologies had to take place. [6] The switch from conventional education to virtual education had its consequences; the teachers were unprepared to take up the new challenge. They lacked the resources and the knowledge to engage in the process. [7] Teachers felt they were overworked with the new turn of
events, conventional learning content had to be digitized, and a new curriculum was introduced. Proper professional anatomy had to be brought about for a more focused and effective outcome. [8]

**IT Infrastructure**

The sudden change enforced both students and teachers to adjust themselves to an unfamiliar technological process in education. It was observed that the IT infrastructure for online education was insufficient or missing. [9] There were many challenges encountered by teachers owing to the lack of proper IT infrastructure. The teachers had limited exposure to online teaching; they experienced a gap in equipment and an environment that was not conducive to online teaching. [10] Technological infrastructure that provides support to teachers should have been made available. The availability of internet connectivity and equipment would have helped in the integration of technology into education. [11] A robust IT infrastructure had not been available in the field of education thereby steps had to be taken to develop technologies that align with online educational concepts. Although there has been resistance towards the incorporation of technology in education, with the current crisis authorities had developed a different perspective towards the incorporation of technology in education. [12] Though a traditional learning environment has many forms of delivering learning content, distance learning lacks the infrastructure to develop this process. The barrier in online education does not lie only in the technology itself but also in the pedagogical concepts used in technology. [13]

**Time Management**

Teachers have stated that the preparation that goes into online lessons consumes more time than the preparation that takes place in conventional lesson planning. It was shown that the teacher’s effectiveness depended on the preparation of educational material and its design. [14] When compared to conventional methods of teaching it is said that online teaching is a more tedious task as it takes a considerable amount of time to plan lessons, teach and thereafter evaluate on a digital scale. [15] Teachers utilized their time not only in online teaching but also in updating and uploading learning content as and when needed. Unlike in traditional learning, environment more time was spent on communication as a variety of communication methods were used in online education. [16] Timely feedback is expected in online teaching. This involves a lot of time as downloading student work, identifying areas that need correction, commenting, and uploading work should be done for each and
every student. Writing comments for every student takes more time than verbal commentary. The teacher’s availability is expected round the clock in online education. [17]

**Increased Workload**

Developing online learning content takes a lot of commitment. Which would add to the teacher’s workload. [18] A considerable amount of time is required for online teaching, as there’s a considerable amount of work that has to be established and developed. [19] The amount of work that goes into corresponding with students is relatively high as students have questions that have to be addressed by the teacher consistently. [20] The teacher has to be fully involved in online teaching by engaging in discussions through threads, emails, and chats. Teachers have to work more to avail the diverse online requirements of students. It is necessary that the teacher remains active throughout the learning process to reap the full benefits of the process. [21] Teachers put in a lot of effort to involve the students in educational activities. They provide the students with meaningful theoretical and practical work that makes the online learning process effective. [22] Teachers struggle to deliver the same amount of content that was previously used in conventional teaching. According to students, teachers work tirelessly to involve students in educational activities that provide the students with flexibility in education and knowledge that makes online learning successful. [23]

**Motivation**

Although many fields have embraced technology, the field of education still lags in the use of technology. [24] Researchers have said that the motivation of teachers would act as a change agent in improving their teaching styles and methods. There are a variety of online tools that could be used as a motivational influence in online teaching. [25] Online tools have acted as a substitute for conventional learning although at times it creates immense difficulty for both teacher and student ranging from downloading problems to installation problems. The need for digital literacy has increased for both teachers and students, thereby, guidance and training should be given in order to increase competency in the use of technology in education. [26] Technology promotes self-efficiency and technological competence in teachers. [27] Lack of motivation in teachers is reviewed as one of the disadvantages of using online teaching tools. This is mainly owing to the lack of expertise and the lack of commitment they have in developing online learning content. When teachers have the knowledge and the skill they are motivated thereby an increase in the quality of their teaching is shown. Students are able to enhance their learning as teachers use creative delivery methods. [28]
Conceptual Framework

Using the data extracted from the review of literature, this conceptual framework was built. The problem statement in the research served as a reference for constructing the conceptual framework. To build the conceptual framework, the terms of the concept were defined and outlined. [29] With the data collected from the literature review, specific variables were identified as to how they relate to each other, bringing more clarity to the findings. The identified four variables were motivation, IT infrastructure, time management, and the increased workload. This conceptual framework was used as, an analytical tool in this research.

Methodology

For this research, several systematic analysis methods were applied. A mixed method was used for this study, initially a qualitative analysis followed by a quantitative analysis. This research also highlights methods utilized for the collection of data and the instruments used for the process. The qualitative data was obtained through interviews conducted with experts in the field. This qualitative data was analyzed using thematic analysis. The quantitative data was collected with the use of a questionnaire that was distributed among teachers in the western province. The quantitative data collected was analyzed statically using multiple regression analysis. The validity and reliability of the data analysis would be concluded with the highest reliability and accuracy. All ethical considerations used during the course of data collection were handled adhering to the best practices in protecting the confidentiality of all participants.

Sample Size

This is a component of a research design, which has a considerable effect on its strength and its scientific significance. [30]This study would use a sample of respondents from the western province. From a population of 1501448 teachers in the western province, the sample size obtained would be approximately 277. Thereby 277 respondents participated in the research.

Formula to calculate sample size
Population size - 1501448

Confidence level - 90%

Margin of error - 5%

Sample proportion - 0.5

Sample size - 277

Data Collection Methods

A certain procedure is used for the collection of data from related sources in finding answers to the research problem. There were several data collection methods, used in this research. The method of collecting data was done to suit the line of study. [31] There were two methods of data collection used for this research. The first qualitative data collection method and the second quantitative data collection method. Qualitative data was collected through interviews that were conducted with experts in the field of education. Quantitative data were collected with the aid of a questionnaire that was given to teachers who had experience in the online teaching process.

Interviews
Research interviews are carried out to explore the views expressed by a group of individuals on a specific topic. This data gathered would be used for qualitative analysis. [32] Data was collected through an interview where the participants answered an open-end question. Twenty participants were selected for the interview; these participants were experts were in the field of education. The participant's work experience and their current positions in the field of education were taken into consideration in the selection. These participants had been involved in the online teaching process from its inception and thereby had gained a wealth of experience in handling the task. For the interviews, the participant's expertise and experience in the online teaching process would be greatly valued. Various methods were applied in order to keep a record of what was expressed during the interview by the participants. These methods included taking notes and audio recordings. The audio recordings were transcribed verbatim before data analysis. The transcribed audio-recorded interview was then generated into a written dialogue. Notes that were taken during the interviews provided important context to the interpretation of audio recordings. Which later on would help remind factors that are important for data analysis. The audio recordings and transcripts obtained from the interviews would be utilized in the qualitative data analysis that would follow.

Questionnaire

This is taken as the key tool for gathering data in a survey of research. A questionnaire is used for the collection of individual data based on a specific topic. [33] For this research, the questionnaire was built based on the information obtained at the interviews. This data was then classified into several categories in order to construct the questionnaire. [34] The questionnaire was translated into both Sinhala and Tamil to suit the requirements of the teachers and their mode of language. The questionnaire was given out to schools in the western province, which included government schools, private schools, and international schools. The distribution of the questionnaires was done both physically and electronically through Google docs and email. With the data collected from the questionnaire a multiple regression analysis was done, hence various identifying scales were used for the process. Identifying processes included taking into account the data obtained from the entire sample population.
Ethical Consideration

When research is done using human data, ethical values and conduct should be taken into consideration. [35] In this research confidentiality of the information obtained from the respondents was done respecting their rights and privacy. The respondents were informed that this research would be done for academic purposes. The respondents were requested not to write their names in any of the forms provided in this research so that confidentiality could be observed. The research was done adhering to all ethical considerations and principles guaranteeing anonymity and citing all the work used as reference.

Analysis

A research data analysis is done by researchers in order to analyze data obtained in the process. The procedure is also responsible for interpreting results, giving insights into the research problem, and giving it more clarity. [36] For this research two types of data analysis were performed namely qualitative analysis and quantitative analysis. For the analysis, the previously collected qualitative and quantitative data were used.

Qualitative Analysis

Qualitative analysis is a process that is designed to concise raw data into themes or categories based on its validity and its interpretation. Inductive reasoning is used for the process where the researcher carefully examines and compares the data. [37] From the qualitative data obtained, a thematic analysis would take place in this research.

Thematic Analysis

This analysis systematically recognizes organizes and categorically sorts the data into themes. This allows the researcher to recognize the data with more clarity and understanding. [38] For the analysis the qualitative data that was collected during the interview was first documented, these transcripts were then carefully scrutinized and categorized. The important features of the data that were of relevance were extracted and coded for further clarity. The coding was then examined to identify significant patterns and themes. The themes were reviewed to check if it reveals a convincing pattern of data that answered the research question. The themes were categorized as Motivation, IT infrastructure, Time management and Increase workload. The analytical narrative was weaved together to draw up a thematic analysis map which was the final outcome of the analysis.
Quantitative Analysis

This analysis was done with numeric data. This type of analysis takes place when the research is scientific in its approach. This method of analyzing statistical data involves less time thereby more data can be collected and analyzed in a shorter period of time. Using software such as SPSS “Statistical Package for the Social Sciences” for a quantitative analysis would help save a lot of time and effort. [39] Prior to this process, a questionnaire was utilized to collect quantitative data and, later the quantitative data collected was analyzed to generate results.

Multiple Regression Analysis

This method of analysis is commonly utilized for quantitative analysis purposes. For this analysis, special analysis software was used. The analysis brought clarity to the quantitative data that was collected. [40] For this statistical analysis, multiple regression data analysis was used. The data obtained was sent through the analysis process with the use of the Statistical Package for the Social Sciences (SPSS), the data feed passed the required assumptions for multiple regression, and thereby valid results were obtained. The results were presented in the form of tables and graphs. The table would include regression coefficients, standard errors, statistics indicating significance, and goodness-of-fit statistics. The graphs would include histograms and p-p charts.

Validity and Reliability Test

In a quantitative analysis, validity is defined as the level at which concepts are measured accurately whereas reliability shows the consistency of measures.[41] For this analysis, all the independent variables, and dependent variables that are operational were used. The model taken for this analysis was the alpha model. The validity and reliability test are shown in the reliability statistics table and the ANOVA table.

<table>
<thead>
<tr>
<th>Reliability Statistics</th>
<th>Cronbach's Alpha</th>
<th>Cronbach's Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.858</td>
<td>.914</td>
<td>20</td>
</tr>
</tbody>
</table>
Table 1

ANOVA Table

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between People</td>
<td>6373.863</td>
<td>276</td>
<td>23.094</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within People</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Items</td>
<td>128170.732</td>
<td>19</td>
<td>6745.828</td>
<td>2064.174</td>
<td>.000</td>
</tr>
<tr>
<td>Residual</td>
<td>17137.668</td>
<td>5244</td>
<td>3.268</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>145308.400</td>
<td>5263</td>
<td>27.609</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grand Mean</td>
<td>4.47</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2

Reporting

The Reliability Statistics Table shows that Cronbach's alpha is at (.858). Thereby the internal consistency is considered excellent as it is above (70).

The ANOVA Table shows that the value of F is at (2064.174), which reaches significance with a p-value of (.000) which is less than the (.05) alpha level. This means there is a statistically significant difference between the different levels of challenges in online teaching.

Normality Testing

The two methods used in normality testing are graphical methods and numerical methods. [42] For statistics, Skewness and Kurtosis were selected. For Histograms, the normal curve on the histogram was selected. If the Kurtosis curve is greater than (3) it is taken as Leptokurtic, if the Kurtosis curve is less than (3) it is taken as Platykurtic. [43] This analysis includes a Frequency table and Histograms.

Statistics Table
### Statistics

<table>
<thead>
<tr>
<th>IT Infrastructure</th>
<th>Motivation</th>
<th>Time Management</th>
<th>Increased Workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Valid</td>
<td>277</td>
<td>277</td>
<td>277</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>7.339</td>
<td>3.411</td>
<td>.974</td>
</tr>
<tr>
<td>Skewness</td>
<td>-.616</td>
<td>-.673</td>
<td>1.268</td>
</tr>
<tr>
<td>Std. Error of Skewness</td>
<td>.146</td>
<td>.146</td>
<td>.146</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>-.811</td>
<td>-.957</td>
<td>2.549</td>
</tr>
<tr>
<td>Std. Error of Kurtosis</td>
<td>.292</td>
<td>.292</td>
<td>.292</td>
</tr>
</tbody>
</table>

Table 3

### Reporting

The Statistics Table denotes the Skewness of the dependent variables between (-1) and (+1) which shows the distribution is highly skewed. Since the kurtosis are less than (3), the dataset shows a lighter tail than shown in a normal data distribution. This says that the data are Flatted or Platykurtic.

### Frequency Table

<table>
<thead>
<tr>
<th>Lack of concentration due to distractions</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of discipline of students in online mode</td>
<td>Motivation</td>
</tr>
<tr>
<td>Lack of social interaction</td>
<td>277</td>
</tr>
<tr>
<td>Monotonous teaching</td>
<td>0</td>
</tr>
<tr>
<td>Difficulty in adapting to technology</td>
<td>-.251</td>
</tr>
<tr>
<td>Limitations in resources</td>
<td>0</td>
</tr>
<tr>
<td>Financial constraints</td>
<td>-.103</td>
</tr>
<tr>
<td></td>
<td>.146</td>
</tr>
<tr>
<td></td>
<td>-.820</td>
</tr>
<tr>
<td></td>
<td>.292</td>
</tr>
</tbody>
</table>

Table 4

### Frequency Table Continued
Table 4

**Reporting**

The Statistics Table denotes that the independent variables in Motivation are between (-1) and (+1) which shows the distribution is highly skewed. Since the kurtosis values are less than (3), the dataset shows a lighter tail than shown in a normal data distribution. This says that the data are Flatted or Platykurtic.

Figure 3 Motivation Histogram shows the set of data that are displayed according to the Motivation Frequency Table.

**Correlation Analysis**

This analysis is done to analyze relationships among both independent and dependent variables. [44] If there is (+) or (−) at the start of Pearson’s correlational coefficient value, it would indicate that there is a negative or positive correlation between the variables. There's no relationship between variables if there is (0) indicted.

**Correlations Table**

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Lack of experience</th>
<th>Lack of knowledge</th>
<th>Unequal distribution of IT Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Valid</td>
<td>277</td>
<td>277</td>
<td>277</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Skewness</td>
<td>-.490</td>
<td>-.505</td>
<td>-.547</td>
</tr>
<tr>
<td>Std. Error of Skewness</td>
<td>.146</td>
<td>.146</td>
<td>.146</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>-.633</td>
<td>-.969</td>
<td>-1.226</td>
</tr>
<tr>
<td>Std. Error of Kurtosis</td>
<td>.292</td>
<td>.292</td>
<td>.292</td>
</tr>
</tbody>
</table>
### Correlations Table

<table>
<thead>
<tr>
<th></th>
<th>Motivation</th>
<th>IT Infrastructure</th>
<th>Time Management</th>
<th>Increased Workload</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Motivation</strong></td>
<td>Pearson Correlation</td>
<td>1</td>
<td>.696**</td>
<td>.158**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>&lt;.001</td>
<td>.008</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>277</td>
<td>277</td>
<td>277</td>
</tr>
<tr>
<td><strong>IT Infrastructure</strong></td>
<td>Pearson Correlation</td>
<td>.696**</td>
<td>1</td>
<td>.042</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>&lt;.001</td>
<td>.000</td>
<td>.481</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>277</td>
<td>277</td>
<td>277</td>
</tr>
<tr>
<td><strong>Time Management</strong></td>
<td>Pearson Correlation</td>
<td>.158**</td>
<td>.042</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.008</td>
<td>.481</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>277</td>
<td>277</td>
<td>277</td>
</tr>
<tr>
<td><strong>Increased Workload</strong></td>
<td>Pearson Correlation</td>
<td>.350**</td>
<td>.509**</td>
<td>.352**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>277</td>
<td>277</td>
<td>277</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).

**Table 5**

**Report**

The Correlations Table denotes that the Pearson Correlation for Motivation, IT Infrastructure, Time Management, and Increased Workload, is at (1), and the Sig. (2-tailed) is at (.000) which indicates that the correlation is of highest significance.

The Correlations Table also shows the Pearson Correlation between Time management and Increased Workload at (.352) this indicates that there is a relationship between Time Management and Increased Workload in online teaching during Covid-19. This satisfied Hypothesis # 3, which predicted that there is a relationship between Time Management and the Increased Workload in online teaching during Covid-19.

**Multicollinearity Analysis**

Multicollinearity takes place when the multiple regression analysis involves multiple variables that are correlated with the dependent variables and with each other. [45] Multicollinearity affects p-values and coefficients but has no influence on the predictions.

**Correlations Table**
Does not influence

<table>
<thead>
<tr>
<th></th>
<th>Motivation</th>
<th>IT Infrastructure</th>
<th>Time Management</th>
<th>Increased Workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation</td>
<td>Pearson Correlation</td>
<td>1</td>
<td>.696**</td>
<td>.158**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>&lt;.001</td>
<td>.008</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>N</td>
<td>277</td>
<td>277</td>
<td>277</td>
<td>277</td>
</tr>
<tr>
<td>IT Infrastructure</td>
<td>Pearson Correlation</td>
<td>.696**</td>
<td>1</td>
<td>.042</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>&lt;.001</td>
<td>.000</td>
<td>.481</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>N</td>
<td>277</td>
<td>277</td>
<td>277</td>
<td>277</td>
</tr>
<tr>
<td>Time Management</td>
<td>Pearson Correlation</td>
<td>.158**</td>
<td>.042</td>
<td>1</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.008</td>
<td>.481</td>
<td>.000</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>N</td>
<td>277</td>
<td>277</td>
<td>277</td>
<td>277</td>
</tr>
<tr>
<td>Increased Workload</td>
<td>Pearson Correlation</td>
<td>.350**</td>
<td>.509**</td>
<td>.352**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>277</td>
<td>277</td>
<td>277</td>
<td>277</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).

Table 6

Reporting

Two diagnostics were done to identify Multicollinearity:

- Analysis of the correlation matrix.
- Compare the tolerance values with the variance inflation factor.

- Analysis of the correlation matrix

Correlation matrix lets you compare correlation of coefficients of an independent variable. Pearson’s collation differs between (+1) and (-1). (+1) indicates that it is a positive correlation whereas (-1) indicates that it is a negative correlation. (0) indicates that there is no correlation. [46] The Correlations Table shows that the Pearson Correlation for Motivation, IT Infrastructure, Time Management, and Increased Workload is at (1), and the Sig. (2-tailed) is at (.000) which indicates that the correlation is of heist significance.

Coefficients Table
Coefficients\(^a\)

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Coefficients</th>
<th>t</th>
<th>Sig.</th>
<th>Collinearity Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
<td>Tolerance</td>
</tr>
<tr>
<td>1 (Constant)</td>
<td>-.737</td>
<td>.177</td>
<td>-4.172</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Motivation</td>
<td>.152</td>
<td>.005</td>
<td>.935</td>
<td>31.158</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>IT Infrastructure</td>
<td>-.059</td>
<td>.012</td>
<td>-.170</td>
<td>-5.122</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Time Management</td>
<td>-.017</td>
<td>.029</td>
<td>-.014</td>
<td>- .587</td>
<td>.558</td>
</tr>
<tr>
<td>Increased Workload</td>
<td>.287</td>
<td>.029</td>
<td>.269</td>
<td>10.071</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

\(^a\) Dependent Variable: Challenges in facilitating online teaching

Table 7

- Compare the tolerance values with the variance inflation factor.

In values that are of low tolerance, a high level of multicollinearity is shown. To analyze this composition, the variable that is dependent is selected into dependent, and also the composition variable that's independent into independent.\(^{47}\) Lower tolerance values reflect a higher degree of multicollinearity. When the tolerance value is greater than (2) and the variance inflation factor is less than (5) there is no risk of multicollinearity. The tolerance values in the 2.7 Coefficients Table were higher than (0.2) and the VIF values were less than (5) thereby it was shown that the VIF values were within the expected range which indicated that the multiregression analysis could be carried out.

Collinearity Diagnostics Table

<table>
<thead>
<tr>
<th>Model</th>
<th>Dimension</th>
<th>Eigenvalue</th>
<th>Condition Index</th>
<th>Variance Proportions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Constant)</td>
<td>Motivation</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>4.845</td>
<td>1.000</td>
<td>.00</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>.086</td>
<td>7.500</td>
<td>.04</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>.037</td>
<td>11.449</td>
<td>.02</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>.021</td>
<td>15.216</td>
<td>.20</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>.011</td>
<td>20.824</td>
<td>.75</td>
</tr>
</tbody>
</table>

\(^a\) Dependent Variable: Challenges in facilitating online teaching

Table 8

Reporting
Most experts in the field take (30) as the number that is used for further investigation. [48] The Collinearity Diagnostics Table shows that the Variance Proportion columns values are less than (90) thereby it could be said that there is no collinearity problem between the predictors. Collinearity Diagnostics Table indicates that the values in the condition index is less than (30) and the values in the Eigenvalue column are close to zero thereby there would be no collinearity.

Model Summary Table

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Summary</th>
<th>Change Statistics</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.937a</td>
<td>.878</td>
<td>.877</td>
<td>.420</td>
<td>.878</td>
<td>491.323</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>272</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;.001</td>
<td>1.711</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Increased Workload, Motivation, Time Management, IT Infrastructure
b. Dependent Variable: Challenges in facilitating online teaching

Table 9

Reporting

The model summary should not be less than (1) and not greater than (3) when it is the Durbin Watson value. [49] In the Model Summary Table, the Durbin Watson value is shown at (1.711) which meets the said criteria. This table represents the summary where the $R^2$ squared value is at (.878). The statistical significance is at (.001) there by the $P<(.05)$ criteria is met. The $R^2$ squared value that is at (.878) shows that variants in the challenges faced in online teaching were predicted from the level of predictors. This shows that the prediction level is good. The Model Summary shows $R$ at (.937), $R^2$ at (.878), adjusted $R^2$ at (.877) and the standard error of the estimate at (.420). This indicates how well the data fits in the regression model. In the multiple correlation coefficient, $R$ is shown at (.937) which indicates that there is a good level of prediction. $R$ is known to be the measure of the quality of a dependent variable that would be predicted.

ANOVA Table
### ANOVA

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>ANOVA</td>
<td>4</td>
<td>86.525</td>
<td>491.323</td>
<td>&lt;.001b</td>
</tr>
<tr>
<td>Residual</td>
<td>47.901</td>
<td>272</td>
<td>.176</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>394.002</td>
<td>276</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: Challenges in facilitating online teaching
b. Predictors: (Constant), Increased Workload, Motivation, Time Management, IT Infrastructure

Table 10

### Reporting

ANOVA tests are done to check if the regression is good for data analysis. The regression is considered good for data analysis if the significant value is less than (.0005). [50] The ANOVA Table was able to statistically predict variables that are dependent. It also checked if the multiple regression model was a good fit for the analysis of data. In this analysis, the ANOVA Table indicated the independent variables, which are the protectors, were statistically able to predict the dependent variable that are the challenges faced in online teaching. It also shows that the F value is at (491.323) and the Sig value is at (.001) which indicates that the P<(.05) criteria is met.

### Coefficients Table

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Beta</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1 (Constant)</td>
<td>-.737</td>
<td>.177</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivation</td>
<td>.152</td>
<td>.005</td>
<td>.935</td>
<td>31.158</td>
</tr>
<tr>
<td>IT Infrastructure</td>
<td>-.059</td>
<td>.012</td>
<td>-.170</td>
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</tr>
<tr>
<td>Time Management</td>
<td>-.017</td>
<td>.029</td>
<td>-.014</td>
<td>-.587</td>
</tr>
<tr>
<td>Increased Workload</td>
<td>.287</td>
<td>.029</td>
<td>.269</td>
<td>10.071</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Challenges in facilitating online teaching

Table 11

### Reporting

The Coefficients table shows that p < (.05), thereby it could be said that the coefficients are statistically and significantly different from (0) this indicates that the correlation coefficient is “significant.” The Coefficients indicate how the dependent variables vary from the independent variable when all of the other independent variables are constant. [51]
Unstandardized Coefficients B shows that Motivation which is at (.152) and Increased workload which is at (.287) has a positive impact whereas IT Infrastructure which is at (-.059) and Time Management which is at (-.017) has a negative impact on the Challenges in facilitating online teaching. Which confirms the first and the second hypothesis.

This reporting satisfies Hypothesis # 1, which predicted the decrease in Motivation. This indicates the lack of motivation in teachers would have a positive impact on teachers who engage in online teaching during Covid-19.

Hypothesis # 2, which predicted the lack of proper IT Infrastructure, would have a negative impact on teachers who engage in online teaching during Covid-19.

Residual Statistics Table

<table>
<thead>
<tr>
<th>Residuals Statistics</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicted Value</td>
<td>Statistics</td>
<td>5.06</td>
<td>.352</td>
<td>1.120</td>
<td>277</td>
</tr>
<tr>
<td>Residual</td>
<td>-.973</td>
<td>1.110</td>
<td>.000</td>
<td>.417</td>
<td>277</td>
</tr>
<tr>
<td>Std. Predicted Value</td>
<td>-2.166</td>
<td>1.374</td>
<td>.000</td>
<td>1.000</td>
<td>277</td>
</tr>
<tr>
<td>Std. Residual</td>
<td>-2.318</td>
<td>2.645</td>
<td>.000</td>
<td>.993</td>
<td>277</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Challenges in facilitating online teaching

Table 12

Reporting

The Residual Statistics Table shows the residual standards of both minimum and maximum values are not less than or more than (3). If it does, it is an outliner, which needs to be removed and the test should be redone. [52] In this table, the minimum residual value is shown at (-.973) and the maximum at (1.110) which meets the said criteria without outliners. Linear regression involves the interpretation and analysis of various residuals in order to confirm the expectations of statistical tests. [53]

Reporting

Figure 4 P-P Plot shows that the plot distribution is normal thereby the dependent variables are distributed well. The P-P plot observations are shown in the form of short lines. The predicted line in regression is shown in the form of a solid diagonal line. The diagonal line indicates that there are normally distributed residual values.
Reporting

Figure 5 Scatterplot shows that the plot distribution of both positive and negative sides of the horizontal line data are presented. The vertical distance is the residual. A dot in the scatter plot indicates one single data point. The several dots that are scattered on the scatter plot shows that there is a low correlation between variables. Thereby scatter plot shows that it has a low positive correlation as the height of the dots shows a slight increase.

Conclusion

The findings of this research indicated that the challenges in facilitating online teaching during the COVID-19 pandemic for secondary schools were many. Teachers were unprepared and unequipped to face the sudden switch from conventional teaching to online teaching and to take up a task of such magnitude. Although the data collected in this research revealed that the teachers encountered many challenges in online teaching it was also revealed that despite all of the challenges, the teachers continued the online teaching process. For this research, a mixed method of data collection and analysis was conducted. The integration of qualitative and quantitative data collection and analysis provided a comprehensive and clear understanding of the final outcome of the research.

The transition from conventional teaching to online teaching made the teachers vulnerable to the new process of teaching, which was a considerable demotivating factor. The teachers lacked the environment, the resources, the skills, and the experience to confidently engage in the online teaching process. There were many shortcomings in the IT infrastructure as it failed to provide the services, equipment, and facilities that were required for online education. Teachers found it difficult to manage their time with the new method of teaching and the increased workload. Thereby it is vital that authorities take the necessary steps to provide teachers with the needed requirements to face the new technological era of education. Teachers should be given the proper training to develop the required skills and knowledge to pursue the task of online teaching.

Although this year has been a process of mastering online teaching, it could be said through trial and error that set targets and goals were achieved, despite the numerous challenges encountered in online teaching during the Covid-19 pandemic. Through the findings of the research it was, revealed that the pandemic had not stalled or hindered online teaching but teachers had been at work catering to the educational needs of each and every student in spite of the drawbacks and the hardship faced in the process. In the midst of all the challenges, the pandemic highlighted the resilience and commitment of teachers, the determination and courage they possessed in taking up any challenge in any given situation.

Declarations
The research “Challenges in Facilitating Online Teaching for Secondary Education during the Covid-19 Pandemic, based on a case study in Sri Lanka” was approved by the Ethics Review Committee of the Sri Lanka Institute of Information Technology in accordance with the Ethics Policy Framework drafted by the Committee.

The research was done adhering to ethical considerations and principles guaranteeing anonymity and citing all the work used as reference. The respondents were informed that this research would be done for academic purposes.

All data analyzed during this study are included in this published article and its supplementary information files.

There are no, known competing financial interests or personal relationships that could have appeared to influence the work reported in this research.
• I as the author confirm the sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

Ethical statement
- Consent statement

Conflicts of Interest Statement

I wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome. I confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed.

I confirm that I have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that I have followed the regulations of our institutions concerning intellectual property.

References


**Abbreviations**

| df | Degrees of Freedom |
IT  Information Technology

ICT  Information Communication Technology

N  Total number of Observations

SPSS  Statistical Package for the Social Sciences

Std. Dev.  Standard Deviation

sig  Significance

Std. Error  Standard Error

VIF  Variance Inflation Factor

**Figures**
Figure 1

Conceptual Framework
Figure 2

Thematic Analysis Map
Figure 3

Motivation Histogram
P-P Plot

Figure 4

P-P Plot
Figure 5

Scatterplot

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Questionnaire.docx