Using the Diffusion of Innovation Theory to Explain Foundation Phase Teachers' Perceptions of Online Zoom Classes During a Pandemic – A Case of a South African Private School

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Abstract. In this paper, the emphasis is on teaching the foundation phases of school via the Zoom platform during the Covid-19 pandemic. Fifteen out of the eighteen teachers of a private school in South Africa completed the survey questions, and the questions were then analyzed using the Diffusion of Innovation Theory. Most teachers felt that they were able to use Zoom successfully, although they prefer face-to-face teaching. The paper's main contribution is the identification of six factors affecting the use of Zoom, namely the importance of being prepared, the role that the environment plays, the resources available, the ability of the student, the infrastructure in place, and lastly, the part that discipline plays. Future research will involve more grades in the study, not only grades 1 to 3, and survey other schools and their teachers using similar online teaching tools.

Keywords: Zoom · Diffusion of innovation theory · Foundation phase teachers · Pandemic

1   Introduction

Like many countries worldwide, South Africa had to stop physical school attendance due to the Covid-19 pandemic. The worldwide Covid-19 pandemic forced many schooling environments to look for Information Communication Technologies (ICT) to continue the academic program. Many resourced private schools in the South African schooling environment resorted to using online Google classrooms, online Zoom classes, and other such ICTs [1]. One such private school adopted Zoom classes to ensure the daily schedule was followed as much as possible. In this article, the foundation phase from Grade 1 to Grade 3 is explored to determine if teachers could teach successfully during the trying Covid-19 period.

2   Background of the Study

The case studied private school is located in a middle- to high-income area. The school established an online timetable that consisted of 40-min sessions, break times, and independent work time. Students were given this timetable before the day that classes started. Teachers provided students with their in-class workbooks to take home. Teachers also uploaded material onto the student portal; parents or guardians were expected to have the uploaded material printed before starting the Zoom classes.

The school offered primarily compulsory Zoom classes. Due to not having control over the student's resources at home, offline learning was also an option. Online Zoom class attendance was more than 85% at all times. It must be noted that the private school and its student cohort is much more resourced than the average South African public school. This research cannot be translated across the education system in South Africa – there can be inferences drawn to other similarly resourced private schools.

Foundation Phase classes in South Africa include grades R to 3 [2]. This study used grades 1 to 3 as Grade R does not exist in the case studied entity. The case studied school is a dual medium English and Afrikaans school. There are three English and 3 Afrikaans classes per grade. The sample for this study was eighteen teachers.

2.1   Zoom Classes

Zoom is a modern learning tool that enables students to learn online. Zoom can be used in many ways – online teaching and online meetings are two examples. Zoom enables video communication facilitating virtual tutoring, advising, career counselling, and mentoring, allowing the students to learn beyond the classroom [3]. Teaching online using Zoom enables synchronous class meetings that allow the teacher and all students to log in to a web conferencing system according to a predetermined scheduled.

The case studied school uses the web conferencing software Zoom, which limits each session to 40 min. Zoom can be used on laptops, desktops, and various other mobile devices (tablets or smartphones), allowing many different platforms for students to access the class sessions.

2.2   Diffusion of Innovation Theory

The diffusion of innovation theory explains how, why and how fast a particular technology or innovation will be adopted. Typically, new innovations have a small number of innovators that use an innovation, which grows progressively as the innovation proves successful [4]. Figure 1 demonstrates how innovation adopters are categorized.

There are five categories that adopters can be classified into: innovators, early adopters, early majority, late majority, and laggards. Roger's diffusion of innovation theory outlines how a potential adopter goes through collecting information, analyzing information, and then determining if the innovation deserves the investment. The potential adopter is concerned with the return being worth the investment [5]. An adopter follows this process before deciding when would be the best time for them to invest in the innovation, if at all.
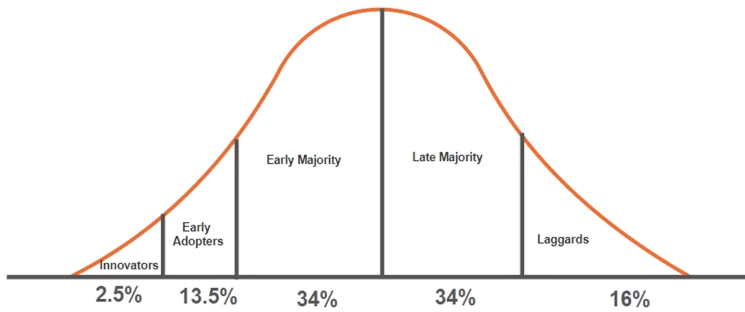
Fig. 1. Categorization of innovation adopters [5:281]

Adoption of a new innovation can be attained by considering five characteristics of the innovation. According to Rogers [5], these five characteristics from the innovator's perspective can determine the adoption of an innovation. The five characteristics are:

Relative advantage: This characteristic talks to the benefits that an individual would consider when adopting an innovation. The greater the relative advantage, the faster the rate of adoption.

- *Compatibility:* "The degree to which an innovation is perceived as consistent with the existing values, past experiences, and need of potential adopter." [5].
- *Trialability:* refers to the degree to which the innovation can be experimented on [5].
- *Observability*: if the innovators can see the value add of the innovation, the easier it is for an innovation to be adopted.
- *Ease of use:* innovations that are easy to understand and use are adopted at a faster rate.

3   Purpose of the Study

The purpose of this study was to explain the Foundation Phase teachers' use of Online Zoom Classes. The study uses Roger's innovation attributes to examine the Foundation Phase teachers' use of Zoom classes. Using Roger's diffusion of innovation, this study analyzed the Foundation Phase teachers' use of Zoom and their perceived attributes that affect their decision to adopt Zoom. The study also outlines factors that impact the use of Zoom by Foundation Phase teachers.

Three research questions helped in achieving the purpose of this study:

1. What are the Foundation Phase teachers' perceptions of Online Zoom classes?
2. How do Roger's (2003) major innovation attributes explain Foundation Phase teachers' perceptions of Online Zoom classes?
3. What factors impact the use of Zoom for teaching Foundation Phase classes?

4   Methodology

A case study approach was used to qualitatively investigate Foundation Phase teachers' use of Zoom and their perceptions regarding its' use in an urban private school in South

Africa. Qualitative research is the collection, organization, description, and interpretation of textual, verbal, and graphic data. Qualitative research typically takes place in a natural setting allowing the researcher to foster understanding from a high level of involvement in the "actual experiences" [6]. An identifier of qualitative research is the social phenomenon being investigated from the viewpoint of the participant. Creswell defines case study research as when a "researcher explores in depth a program, an event, an activity, a process, or one or more individuals" [7].

This study collected and interpreted data via a questionnaire. The questionnaire had both open and closed-ended questions. Thematic analysis and descriptive statistics were used to analyses the data. The sample for this study was the Foundation Phase teachers at an urban private school. There was a total of eighteen Foundation Phase teachers, fifteen of which completed the questionnaire. Data were collected anonymously, and no participant will be able to be identified by the presentation of data. Table 1 shows the teachers, number of years of experience teaching foundation phase, and age category.

Table 1. Age and number of years teaching Foundation Phase.

ID	Age category	Number of years teaching foundation phase
1	40–49	19
2	30–39	15
3	40–49	23
4	20–29	2,5
5	20-29	4
6	50–59	20
7	20–29	4
8	30–39	16
9	30–39	8
10	50–59	28
11	>60	38
12	40–49	18
13	30–39	10
14	30–39	15
15	40–49	21

Twelve of the fifteen participants have ten or more years of experience teaching the foundation phase. This demonstrates the high level of experience of the participants. The questions were taken from three other studies, diffusion of innovation study for the use of interactive whiteboards [8], a study for the perception of an individual adopting an Information Technology (IT) innovation [9] and Detailed Review Of Rogers' Diffusion Of Innovations Theory And Educational Technology [10]. The school management

tested the questionnaire before they were finalized and distributed. The questionnaire was made up of open and close-ended questions. The close-ended questions were asked on a 5 point Likert scale – Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree. The open and close-ended questions are presented and discussed in the analysis and findings sections.

5 Analysis

The collected data were analyzed qualitatively by organizing responses according to themes in order to determine what factors impact the use of Zoom by Foundation Phase teachers. Descriptive statistics were used to present the data gathered in the close-ended questions.

The summarized response to the close-ended questions:

- 93% of respondents disagree with Zoom being better than physical classes, and 7% were neutral.
- 100% of respondents disagreed with the statement that Zoom works just as well as physical classes.
- 93% of respondents disagree that Zoom enables them to accomplish their daily tasks more quickly, and 7% were neutral.
- 93% of respondents disagree that Zoom makes it easier to do the task at hand, and 7% were neutral.
- 86% of respondents disagreed that Zoom enhanced their effectiveness to complete the task, with 7% being neutral and 7% agreeing.
- 80% of respondents disagreed that Zoom gave them greater control over the task, with 14% being neutral and 6% agreeing.
- 60% of the respondents disagree that using Zoom was compatible with the way they teach, with 33% being neutral and 7% agreeing.
- 93% of respondents agreed that experimenting with Zoom before adopting it, is very important, and 7% disagreed.
- 100% of respondents agreed that it is essential to ask questions about Zoom before acquiring it.
- 80% of respondents would have no difficulty telling others about the results of using Zoom, while 20% were neutral.
- 73% of respondents believe they could communicate to others the consequences of using Zoom, while 27% were neutral.
- 80% of respondents find Zoom clear and understandable, with 13% being neutral and 7% disagreeing.
- 100% of respondents agreed that learning to operate Zoom is easy for them.

The summarized response to the open-ended questions are outlined below:

- Do you consider the online Zoom class an effective tool for your students' learning? Give reasons.

Most respondents answered yes and no based on the circumstances. They indicated that Zoom was effective in giving students access but was less effective than the classroom. They further highlighted that Foundation Phase needs more hands-on interaction than Zoom allows. Teachers realize too late that a student does not understand the work being taught only when the work is handed-in. Whereas, in a physical environment, students' shortfalls are immediately picked-up on. Some students are shy, and some need one on one interaction to realize their potential fully. Respondents identified these characteristics that determine the success of the Zoom environment.

- Did you access online material or information from the Internet or Intranet during the online classes?

  93% of respondents accessed online material from the Internet or Intranet.

- What are the advantages of using Online Zoom classes for instruction? Elaborate - you are welcome to provide reasons from both teacher and student perspectives?

  Zoom allows continued teaching in times of a pandemic, illness, or crisis to ensure the health and safety of teachers and students. Allows easy interaction if the internet is stable. Can visually interact as the students and teacher can see each other. The teacher can also share their screen working through the content. Sessions can be recorded for students to catch up or for teachers to use to improve their teaching. Students can also use recordings to work at their own pace. It can be an affordable means of communication if all stakeholders have uncapped internet connectivity. Students have an opportunity to become familiar with technology and keep up to date with advancements. Zoom allows individuals to work from the comfort of their own homes. Zoom allows the curious nature of students to explore and have fun with technology. Zoom further allows teachers to have control of the class as they can mute students if required.

- What are the disadvantages or challenges of using Online Zoom classes for instruction? Elaborate - you are welcome to provide reasons from both teacher and student perspectives.

  Technology can fail when least expected, leaving teachers stressed about reconnecting or leaving students feeling uncertain. Load shedding which a restriction of the country's electricity supply in order to keep the electricity grid stable. If Internet connectivity is not stable, teachers end up spending much time repeating instructions, and also students are lost when they do rejoin the session after losing connectivity. Zoom does not allow all the students to be viewed at once. Many siblings share devices which make it challenging for them to be online during the entire school day. Some students are not adequately seated to participate in the Zoom class and complete the associated physical worksheets or books. Foundation Phase learners sometimes need support to ensure that they are logged on at the right time and have the right resources on hand for the scheduled session – many parents are working and are unable to provide this support. The opposite of this also happens, "helicopter parents"; these parents get over-involved in the students learning and confuses the students. Teachers are unsure of what students

understand and cannot adequately monitor what the students are doing. Students tend to suffer in silence as they do not want attention by asking questions or not communicating their difficulties. Teachers find it difficult to teach new concepts but find it easier to do revision using Zoom. Students take a lot of time to settle into class and also encounter many distractions while in the Zoom class. These distractions include eating, dogs barking, siblings crying, parents talking, and household appliances, to name a few. Teachers find the quality of students' work is inferior when taught on Zoom versus the physical classroom. Children can't maintain attention online, resulting in them being lost. They don't follow all the rules, and the computer literacy between the students differs. The school uses the free version of Zoom, so class sessions are limited to 40 min per session – this sometimes does not allow the teacher to complete their explanation or exercise. The momentum is lost if the session ends, and then the students and teacher must log back on to a new session. Students are sometimes poorly disciplined, attending class late, unmuting themselves, or eating during class. Not all Foundation Phase students can concentrate for long periods in an online environment. Students do not have all the required resources available on hand to complete a given task.

- Have you received any training (workshops, training sessions etc.) about the uses of Online Zoom classes?

    20% of teachers indicated that they received no training on the use of Zoom. The other 80% of respondents received some informal training at the school. Mostly they shared information with colleagues or figured out things as they went along.

6   Findings

The findings of this study are outlined in response to each research question.

6.1   What Are the Foundation Phase Teachers' Perceptions of Online Zoom Classes?

A qualitative approach was used to explore the respondents' perceptions of Zoom. Therefore, they were asked these questions to answer this research question.

- What are the advantages of using Online Zoom classes for instruction? Elaborate – you are welcome to provide reasons from both teacher and student perspectives.
- What are the disadvantages of using Online Zoom classes for instruction? Elaborate – you are welcome to provide reasons from both teacher and student perspectives.
- What are the challenges that you face when using Online Zoom sessions for teaching?
- Have you received any training (workshops, training sessions etc.) in relation to the uses of Online Zoom classes?

    From the analysis of these questions, we can conclude that the Foundation Phase teachers find value in using Zoom as a supporting rather than a primary medium of instruction. Although there are numerous advantages, the disadvantages outweigh

the advantages of using Zoom in foundation phase teaching. The value lies in Zoom enabling a continued academic program for unexpected events like a pandemic and other environmental events that do not allow the physical gathering of teachers and students.

The biggest challenge is ensuring the internet infrastructure is stable for everyone. If the Internet connectivity is not stable, much time is wasted trying to get everyone to common ground. Student concentration and discipline are very challenging and sensitive to deal with in an online environment. Teachers are adequately trained and have systems in place at school to handle these sensitive matters. The other challenges have ways to counteract them, such as ensuring students have all the relevant resources. Teachers can communicate in advance the specific resource lists required for specific sessions. The limited duration of the Zoom sessions can be overcome by the school purchasing a Zoom license for unlimited use.

Although the training was not sufficiently provided, most disadvantages and challenges are not related to a lack of training. It appears that most teachers were okay with exploring Zoom and learning the tool as they progressed – it can be deduced that many aspects of Zoom are self-explanatory.

In summary, Foundation Phase teachers' perceptions of Zoom is that it is a tool to be used in an emergency or unexpected circumstances to support the continuity of the school's academic program. They do not in any way see Zoom in its' current form replacing traditional in-class teaching.

6.2   How Does Roger's (2003) Major Attributes of Innovation Explain Foundation Phase Teachers' Perceptions of Online Zoom Classes?

This research question was addressed by the close-ended questions that were analyzed descriptively. This was used to explore the respondents' use of Zoom and the factors that might affect their decision to use it. The Foundation Phase teachers' response to the questions helps address the five major attributes of innovation that affect the teacher's decision to use Zoom. Rogers' (2003) attributes of innovation are relative advantage, compatibility, trialability, demonstrability, and ease of use.

- Relative Advantage

   These questions addressed this indicator:

– Zoom is better than physical classes.
– Zoom works just as well as physical classes.
– Zoom enables me to accomplish my daily tasks more quickly.
– Zoom makes it easier to do the task at hand.
– Zoom enhances my effectiveness in completing the task.
– Zoom gives me greater control over the task.

The soundest predictor of an innovation's rate of adoption is its perceived relative advantage. This indicator talks to the benefits that an individual would consider when adopting an innovation. From the analysis, it is evident that respondents mostly disagreed

with these indicators. The respondents disagree with Zoom being better or working similarly to physical classes. The respondents do not see this innovation as being able to support their objectives better. Therefore, this indicator had a negative response.

- Compatibility

    This question addressed this indicator:

– Using Zoom is compatible with the way I teach.

    According to Rogers [5], compatibility refers to "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and need of potential adopter." The process of adopting a particular innovation can be fast-tracked if the users of the innovation find it compatible with their experiences and expectations. Concerning Zoom classes, the teachers mainly had a negative perception. The teachers could not translate their regular, tried and tested approach to a fully online environment via the Zoom class. This indicator had a negative response.

- Trialability

    These questions addressed this indicator:

– Experimenting with Zoom before adopting it is very important.
– It is essential to ask questions about Zoom before acquiring it.

    Trialability refers to the degree to which the innovation can be experimented on [5]. Participants did not have a choice whether to use Zoom classes. This was compulsory for the teachers. Many of them saw the benefit of experimenting with Zoom before class. This facilitated their preparedness. They also felt that asking questions before implementing is better; however, it was mandatory in this instance, so they did not have the opportunity to question technology adoption. This indicator had a positive response.

- Observability/Demonstrability

    These questions addressed this indicator:

– I would have no difficulty telling others about the results of using Zoom.
– I believe I could communicate to others the consequences of using Zoom.

    This refers to the degree to which the results are visible to the affected community [5]. The respondents are mostly comfortable with telling others or communicating the results of using Zoom. This indicator had a positive response.

• Complexity/Ease of Use

These questions addressed this indicator:

– Zoom is clear and understandable.
– Learning to operate Zoom is easy for me.

This indicator refers to how innovation is easy to use and understand [5]. Respondents find Zoom both easy to use and understandable. This indicator had a positive response.

These five indicators played a role in motivating the respondents to use or plan to use Zoom for their teaching. Although three of the five characteristics received a positive response, the essential characteristic of relative advantage received a negative response. This again points to the respondents using this innovation under extenuating circumstances but not as an innovation that can replace the traditional classroom.

6.3 What Factors Impact the Use of Zoom for Teaching Foundation Phase Classes?

This question was answered by using thematic analysis. The advantages, disadvantages together with challenges were analyzed. Common findings were grouped into themes that are the factors that impact the use of Zoom for teaching Foundation Phase students.

Figure 2 depicts the factors that impact the use of Zoom for teaching Foundation Phase students. The aspects are described in no particular order.

• Being prepared

Both teachers and students must be adequately prepared. Teachers must have their electronic material prepared and uploaded to prevent wasting time getting ready. Students must have access to their virtual schedule to report timeously to the session.
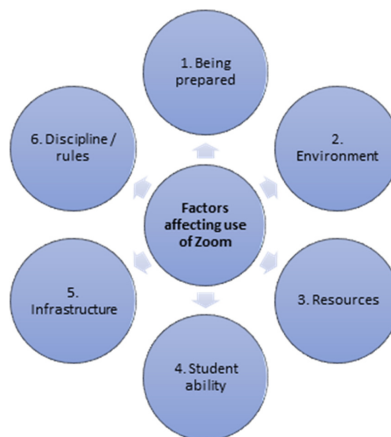

Fig. 2. Factors that impact the use of zoom for teaching foundation phase students

- Environment

A conducive environment needs to be created. Teachers and students should ideally be in a room that can reduce environment sound like talking or dogs barking in the background. Adequate seating and correct furniture dimensions should be in place. There needs to be a "formal" area where students can work to foster the "feeling" of being in the classroom.

- Resources

Teachers must communicate to students and their guardians in advance of the resources that will be required. Teachers can also print and supply the resources (worksheets and class books). Students or guardians must ensure that all relevant material for a particular session is on hand and within reach. Ideally, each student must have an electronic device to work on independently, not a mobile phone. The device must enable good auditory and visual specifications

- Student ability

Arrange separate classes or schedules for students struggling with concentration or the ability to work independently. The school must be aware that this will mean more teaching resources.

- Infrastructure

Adequate infrastructure is crucial. Uncapped access to a stable Internet connectivity, with decent download speeds. Poor infrastructure results in lost time and missed communication.

- Discipline/rules

Setting and adopting rules is vital. No eating allowed during the session. No speaking unless asked to. No discussing non content-related concerns. Attend the session on time.

7   Conclusion

It is concluded that a private school in South Africa managed to transition to online Zoom classes during the Covid-19 pandemic successfully. Most teachers felt that Zoom was clear and understandable, and easy to communicate to others, although teachers still prefer face-to-face teaching. The Diffusion of Innovation Theory is used to explain the teachers' perceptions of Zoom classes, and it is discussed in terms of compatibility, trialability, observability, and complexity or ease of use. Six factors from the teachers' responses were identified as themes. Future research can include expanding the study to other schools as well as other grades to determine if Zoom is a suitable substitute for face-to-face teaching, as was deemed necessary in the case of Covid-19. Future research can also include the investigation of schools introducing a distance learning option using

Zoom as the tool of class dissemination. This could potentially improve the income of the school without too many additional resources being required.

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