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Assessing the attitudes of Dominican primary school teachers toward the integration of ICT in the classroom

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ABSTRACT

Many teachers in developed countries have integrated the use of computers into their classrooms; however, the digital divide has limited this integration in developing countries such as those in the Caribbean. Through a combination of questionnaires and interviews, Dominican primary school teachers' attitudes toward computers; their computer-based activities; and the challenges that reduced the frequency of computer use in their classrooms; were queried. Significant differences in computer enjoyment and computer anxiety between young and mature teachers were reported. Although teachers were willing to use computers in their classrooms, challenges such as a lack of resources, limited support and insufficient training prevented more extensive use. Nevertheless, teachers were able to create tests and presentations using word processing and presentation software. This research improves the understanding of teachers' attitudes toward technology in developing countries and recommends strategies to overcome barriers to classroom technology integration.

Keywords: *teachers' attitudes, information and communication technology, digital divide, Dominican primary schools, millennials*

INTRODUCTION

Information Communication Technology (ICT) is seen as an influential tool for educational change (Fu 2013), and educators have stressed that, if used effectively, it can create enriching, holistic learning environments that provide authentic learning experiences for teachers and students (Sang, Valcke, Braak, et al. 2010). As a result, governments worldwide have implemented measures to integrate technology into classroom instruction (Albirini 2006). For example, in an effort to develop a knowledge economy, Singapore created an ICT Master Plan that integrated ICT with curriculum change, assessment, instruction and professional development (Kozma 2008). Similarly, Finland introduced the Information Strategy for Research in Education policy in order to develop students' information society skills, build open education and research networks and formulate educational information products and services.

Researchers, however, cautioned that the successful implementation of technology depended significantly on the attitudes of the teachers (Christensen 2002; Inan & Lowther 2010; Teo 2008). It has been suggested that teachers' attitudes toward computers determine how and if these computers will be used in the classroom. According to Yalcin, Kahraman, and Yilmaz (2011), teachers who cultivated positive attitudes utilised technological tools during instruction to make learning more thought-provoking and engaging for their students.

Caribbean governments have demonstrated an interest in the implementation of ICT in education and have made substantial financial investments in the technological infrastructure of primary and secondary schools, for example the EduTech programme in Barbados (Walcott, Grant, Lorde, et al. 2011)). These learning institutions are gradually being provided with computer facilities, computer-based tools and digital learning resources.

In the Commonwealth of Dominica, educationalists have debated the effectiveness of the ICT implementation at primary, secondary and tertiary institutions (Andrew & Durand 2001). Moreover, over the last decade, numerous ICT programs have been implemented and piloted in primary and secondary schools; however, ICT integration has been slow and complicated. Given that ICT integration has substantial financial outlays associated with it, it is necessary to investigate the root causes of the slow ICT diffusion in the school system.

Education in Dominica has undergone several reforms including the introduction and use of ICT in primary school classrooms. The National ICT Policy (2004) highlighted two essential factors that specified the role of ICT. These were: to exploit ICT, such that students had greater control over their learning and thus develop skills at their own level and pace; and, to create a teaching force that was knowledgeable and capable of using ICT as a tool to enhance teaching and learning.

Various measures to date have been undertaken to achieve these objectives, for example:

1. Each Dominican primary school has been equipped with an Educational Management Information System (EMIS) (Andrew & Durand 2001), which is used for data collection; analysis and management of student attendance and grades; and, the storage of staff bio-data;

2. In 2005, a three-year project was launched to outfit every primary school with a computer laboratory (one computer for every five students). This resulted in 80 percent of these schools being equipped with wireless Internet connections (Dominica ICT Policy for Education 2005);

3. The 2go Convertible Classmate Pilot Project was implemented by the Ministry of Education at various primary schools in Dominica in an effort to increase the technological skills of teachers and students; promote small group teaching; and, facilitate online learning activities (A.J. Durand, personal communication, September 27, 2013); and,

4. Numerous workshops on strategies to integrate ICT into the curriculum have been held periodically.

Given the importance of classroom integration of ICT and the difficulties experienced with this process in Dominica, it is vital to investigate the underlying causes of these problems. According to the literature (Yalcin et al. 2011), teachers' attitudes predict the effectiveness of the use of technological tools in the classroom. Therefore, it is essential for further studies to be conducted to investigate Dominican teachers' attitudes toward the integration of ICT into their classrooms, identify the ways in which computers are used in their classrooms, and explore the challenges faced in the implementation of computer-based activities.

A search of the existing literature revealed no published research on the attitudes of Dominican primary school teachers toward computers, or their use of computers in classrooms. Given the high implementing cost of integrating ICT into classrooms, studies such as the current research, which describe the current state of ICT integration and its effectiveness, are essential. Consequently, this research informs educators and governments about the barriers to ICT integration in primary education in developing countries like Dominica. This information can be used to inform the policies necessary to overcome this aspect of ICT integration.

LITERATURE REVIEW

Kutluca (2011), who defined computer attitude as a person's overall evaluation or feeling of favour toward computer technologies and computer related activities, believed that it was directly related

to computer use in the classroom. Furthermore, Teo (2008) noted that the attitudes of teachers toward technology and their ability to use it in the classroom, determined whether students were able to learn successfully using it.

Alternatively, Afshari, Bakar, Luan, et al. (2009), elucidated that technology attributes were the other factors that influenced how a teacher felt about technology. These authors noted that teachers would be more accepting of technology if they believed that the technology satisfied Rogers (1995) Theory of Perceived Attributes, namely: (1) had a more significant advantage over current innovations (relative advantage); (2) was compatible with familiar methods and practices (compatibility); (3) was easy to use, understand and manipulate (complexity); (4) provided observable feedback (observability); and, (5) could be experimented with before actual implementation (trialability).

According to Amante (2007), technology should not only be used to teach primary schools students how to use ICT, but it should also be used for their educational development. The author explained that a teacher's ability to expand, enrich, engage and motivate students to use technology hinged on how knowledgeable and skilful the teacher was with it.

In support of the importance of teachers' knowledge and skills, Ertmer, Ottenbreit-Leftwich, Sadik, et al. (2012) suggested that if teachers were trained in the context of their institution and classrooms, together with students, there would be greater opportunities for concepts, methods and principles of technology integration to be retained. Hew and Brush (2007) also argued that inadequate technology knowledge and skills posed a challenge for teachers, in that, with only basic computer skills, teachers were unable to make effective use of the tools when attempting to create technology-enriched lessons.

Kopcha (2012) reported that rigid timetables that gave teachers little time to use technology hindered its integration into the classroom. Furthermore, Fu (2013) discussed the view that a lack of computers limited what teachers were capable of doing with ICT, which in turn led to low-level ICT integration. Even if the technology were available, the lack of a plan or a long term vision of its use after it had been installed, would result in teachers finding it difficult to use it in their classrooms (Hew & Brush 2007).

Several researchers have noted that an understanding of personal characteristics that influence a teacher's ability to adapt and integrate ICT into teaching is essential (Buabeng-Andoh 2012; Elsaadani 2013; Rana 2013). These authors identified characteristics such as age, gender, and, computer and instructional experience as variables that affected attitudes toward high-level computer use.

Rana (2013) in a study of twenty-one (21) teachers from a teacher education college in North India found that gender had no effect on attitude to computer use. This position was supported by Mwila (2018) who recorded positive attitudes toward ICT for both male and female teachers. Rana (2013) also found that teachers in different age groups had different attitudes toward computer use. This view was earlier supported by Kumar, Rose, and D'Silva (2008) who reported that younger teachers tended to use computers for instruction more frequently than more experienced and older teachers. In support of these findings, Buabeng-Andoh (2012) affirmed that new teachers would be more inclined to learn about and use technology for instructional purposes. A similar result was found by Mwila (2018) who reported a significant difference in attitudes toward ICT integration based on age of teachers at a secondary school in Tanzania.

Although millennials are generally considered more "tech-savvy" than Gen-Xers and Baby Boomers, Walcott, Garner-O'Neale, and Depradine (2013) reported that part-time Gen-X students were more highly skilled than millennials in a Caribbean-based study. In this study, Gen-X students

had better ICT skills, specifically word processing, use of spreadsheets, computer maintenance and computer security, than millennials.

In summary, teachers' computer use was directly related to their attitudes and their ability to use this technology. Younger teachers were more likely to have a positive attitude toward computers and use this technology in their classrooms. Conversely, rigid timetables and a lack of computers led to low-level computer use. Furthermore, if these teachers were not sufficiently skilled, then students were less likely to be able to use the technology for learning.

METHODOLOGY

A descriptive case-study design (Zainal 2007) was employed in this study. Using this design the researcher began with a descriptive theory to support the description of the phenomenon under study. The goal of this design was to describe the data as they occur. Descriptive research utilises multiple data sources (qualitative and quantitative) thus providing a more comprehensive understanding of the phenomenon under investigation. This approach allowed the attitudes of Dominican primary school teachers toward ICT integration to be determined, the ICT that was being used to be established and the factors that hindered frequent use of ICT to be identified. Consequently, the research questions investigated in this study were:

- **Research Question 1.** What are Dominican primary school teachers' attitudes toward computers?
- **Research Question 2.** Do Dominican primary school teachers' computer attitudes differ by age?
- **Research Question 3.** How do Dominican primary school teachers use computers in their classrooms?
- **Research Question 4.** What factors hinder Dominican primary school teachers from using computers more frequently in their classrooms?

Participants

Fifty-four teachers from four primary schools in Dominica (three urban and one rural) were conveniently selected to participate in this study. Fifty of these participants were female and four were male. The ages of the participants are presented in Table 1. These fifty-four participants completed The Teachers' attitudes toward information technology (TAT v3.2a) survey (Knezek & Christensen 1998). From these fifty-four participants, fourteen (two males and 12 females) were conveniently selected for one-on-one interviews.

This study was limited by the small number of male participants which led to the inability to determine if there were differences in attitudes toward ICT integration based on gender. Unfortunately, this limitation is a result of the low percentage of male teachers in the primary school system in Dominica (Andrew 1999) and more importantly in the four schools under study. To overcome this limitation, one-on-one interviews were conducted with two of the four male participants so that the male voice could be recorded.

Table 1: *Teachers' Ages*

Characteristic	Range (years)	Frequency
Age	18-30	13
	31-40	22
	>40	19
Total		**54**

Research instruments

To gather information on the attitudes toward computers, teachers' use of computers and factors that were hindering ICT use in the classroom, questionnaires and interviews were employed. The TAT Survey was selected because it combined several well-validated subscales including measures for computer enjoyment (E) and computer anxiety (A) and had been used in several settings including k-12 classrooms (Hancock, Knezek, & Christensen 2007; Morales 2006).

The items presented in each scale comprised of positively and negatively worded statements as shown in Table 2. Item responses were measured through a 5-point Likert scale with numerical values ranging from 1 = "Strongly disagree," to 5 = "Strongly agree" for positively worded items. All negatively worded items were reversed prior to data analysis.

Table 2: *The Computer Enjoyment (E) and Computer Anxiety (A) Subscales of the TAT Survey*

Scales	Item
E1	I enjoy doing things on a computer.
E2	[a]I am tired of using a computer.
E3	I concentrate on a computer when I use one.
E4	I enjoy computer games very much.
A1	[a]I think that it takes a long time to finish when I use a computer.
E5	I enjoy lessons on the computer.
A2	I think that computers are very easy to use.
E6	I feel comfortable working with a computer.
E7, A3	[a]I get a sinking feeling when I think of trying to use a computer.
E8, A4	[a]Working with a computer makes me nervous.
A5	[a]Using a computer is very frustrating.
A6	[a]I will do as little work with computers as possible.
E9, A7	[a]Computers are difficult to use.
A8	Computers do not scare me at all.

[a]Negatively worded statements

One-on-one, semi-structured interviews were conducted with the fourteen (14) participants to learn about their use of computers in the classroom and to determine what factors limited their use. The interview questions included:

- How are computers used in your classroom?; and
- What factors influence your use of computers in the classroom?

Data collection procedures

Questionnaires were distributed to teachers of four primary schools by one of the researchers after receiving permission from the IRB committee of the University of the West Indies, the Ministry of Education in Dominica, the principals of the primary schools and the teachers who agreed to be a part of the study. All fifty-four of the questionnaires that were distributed to the teachers were completed and returned and used in the data analysis.

Interviews were conducted by one of the researchers at the teachers' schools and lasted approximately 20 minutes each. Participants' responses were recorded on paper and field notes were written up after the interviews.

Data analysis

Descriptive statistics (means and standard deviations) were used to measure primary school teachers' attitudes toward computers. A One-Way Anova test was used to determine if there were any significant differences in computer attitude (computer enjoyment and computer anxiety) across age groups. Finally, content analysis (Hsieh & Shannon 2005) was used to interpret the teachers' responses regarding computer use and factors hindering frequent use of computers. Statistical analysis was conducted using SPSS.

RESULTS

The results of the questions addressing teachers' attitudes toward computers, how their attitudes differ by age, how they use computers in their classrooms and the factors that hinder computer use in their classrooms are presented in this section.

Research Question 1: What are Dominican primary school teachers' attitudes toward computers?

The attitudes of the Dominican primary school teachers toward ICT integration were measured using the computer enjoyment and computer anxiety subscales of the TAT Survey. The mean scores for the computer enjoyment and computer anxiety subscales were 4.21 (SD=0.595) and 4.12 (SD=0.703), respectively. The mean score for each item in these subscales are presented in Table 3 and Table 4 below.

Table 3: *The Mean Scores for the Items in the Computer Enjoyment Subscale*

Item	Mean[a]	Std. Dev.
I enjoy doing things on a computer.	4.63	0.487
[b]I am tired of using a computer.	4.43	0.767
I concentrate on a computer when I use one.	4.02	0.858
I enjoy computer games very much.	3.57	1.312
I enjoy lessons on the computer.	4.37	0.681
I feel comfortable working with a computer.	4.13	0.912

[b]I get a sinking feeling when I think of trying to use a computer.	4.22	1.022
[b]Working with a computer makes me nervous.	4.26	1.031
[b]Computers are difficult to use.	4.28	0.960

[a]n = 54 [b]Negatively worded statements

Table 4: *The Mean Scores for the Items in the Computer Anxiety Subscale*

Item	Mean[a]	Std. Dev.
[a]I think that it takes a long time to finish when I use a computer.	3.78	1.093
I think that computers are very easy to use.	3.87	0.870
[a]I get a sinking feeling when I think of trying to use a computer.	4.22	1.022
[a]Working with a computer makes me nervous.	4.26	1.031
[a]Using a computer is very frustrating.	4.19	1.029
[a]I will do as little work with computers as possible.	4.13	1.150
[a]Computers are difficult to use.	4.28	0.960
Computers do not scare me at all.	4.22	1.058

[a]n = 54 [b]Negatively worded statements

Research Question 2. Do Dominican primary school teachers' computer attitudes differ by age?

The reliabilities of the computer enjoyment and computer anxiety subscales were measured using Cronbach's Alpha and their values were 0.827 and 0.836, respectively. These scales were therefore deemed reliable and used in the analysis that follows.

A one-way ANOVA between subjects was conducted to compare the effects of age on computer enjoyment in the age groups 18-30 years, 31-40 years and over 40 years. There was a significant effect of age on computer enjoyment at the $p<.05$ level for the three categories [$F[2,51]=11.685$; $p<.000$]. Post hoc comparisons using the Tukey HSD test indicated that the mean score for the 18-30 years category ($M=4.513$, $SD=0.376$) was significantly different from that of the over 40's, ($M=3.766$, $SD=0.638$); and the mean score for the 31-40 years category ($M=4.419$, $SD=0.428$) was significantly different from that of the over 40's. However, the 18-30 years age group did not significantly differ from that of the 31-40 years age group. These results suggested that the millennials (18-30 years) and the 31-40 years age group which comprised mainly of Gen-X teachers (but included some millennials) enjoyed the use of computers much more than the older teachers.

A one-way ANOVA between subjects was also conducted to compare the effects of age on computer anxiety in the age groups 18-30 years, 31-40 years and over 40 years. There was a significant effect of age on computer anxiety at the $p<.05$ level for the three groups [$F[2,51]=4.589$; $p=.015$]. Post hoc comparisons using the Tukey HSD test indicated that the mean score for the 18-30 years group ($M=4.404$, $SD=0.550$) was significantly different from that of the over 40's ($M=3.757$, $SD=0.843$); and the mean score for the 31-40 years age group ($M=4.261$, $SD=0.525$) was significantly different from that of the over 40's years. However, the results for 18-30 years age group did not significantly differ from those 31-40 years. These results suggested that the

millennials (18-30 years) and the 31-40 years age group of teachers were much less anxious when using computers than the older teachers.

Research Question 3. How do Dominican primary school teachers use computers in their classrooms?

During the interviews, the participants revealed that they used computers in the classroom to introduce and reinforce concepts, explain information and display content. More specifically, they used computers to:

- Present Microsoft PowerPoint lessons;
- Complete administrative tasks, such as the typing of a test or examination;
- Gather new ideas on how to present enriching lessons;
- Gather information on topics to be taught in class;
- Find activities and learning resources online for class assignments; and,
- Create and or customise worksheets for particular lessons.

Research Question 4. What factors hinder Dominican primary school teachers from using computers more frequently in their classrooms?

Several themes emerged regarding the issues that prevented participants from using computers more frequently in their classrooms. These included:

- *Inadequate support*. Participants were not familiar with the operating system being used on most of the equipment that they had received from the government-led projects. They found this very challenging and frustrating and as a result, seldom used these tools.

- *A lack of computer skills*. Participants were unable to effectively plan and execute lessons due to insufficient training on how to create lessons using the technology provided. Similarly, participants exhibited basic computer skills but lacked skills in the use of other ICT tools and software such as video projectors and wikis.

- *A lack of resources*. Participants stated that having multiple classes using the same computer laboratory limited the time during which each class was able to use the laboratory; therefore, time for computer-based activities was limited. There was also the added burden of scheduling the laboratory space to ensure that every class had the opportunity to use the facilities. Participants noted that it was rare for all of the computers in the laboratories to be working due to a lack of computer maintenance and many computers were obsolete. As a result, classes that had many more students than functioning computers were disadvantaged.

- *Ineffective monitoring of students' computer-based activities*. Participants were unable to monitor their students' computer activities effectively. They found it challenging to supervise how students were using the computers during a given lesson and to monitor the websites that were being accessed on the Internet.

- *Time restrictions*. Many schools in Dominica had multi-grade classrooms and only one teacher was usually assigned to each of these classrooms. This teacher was required to create and present lessons for all of the subjects at each grade level present in the class. Participants believed that adding ICT lessons to their already heavy workload was demanding and left little time to plan, design and develop computer-based lessons.

- *Insufficient training*. The participants noted that there was a lack of on-site training and assistance. Furthermore, they believed that the periodic ICT workshops were inadequate.

DISCUSSION

The mean scores for the computer enjoyment and computer anxiety subscales were relatively high suggesting that several teachers enjoyed using computers and did not have high anxiety while using this technology. Of note was the mean score for the computer enjoyment subscale, 4.21 (SD=0.595) which was greater than the 4.12 (SD=0.703) of the computer anxiety subscale.

The item with the lowest mean score in the computer enjoyment subscale was "I enjoy games very much." Although at first glance, this might seem reasonable, research has shown that games are engaging and can help students to learn (Walcott & Corbin Babb 2014, 2016; Walcott & Romain 2017). There is, therefore, a missed opportunity given that teachers could integrate game play into the curriculum to enhance student engagement and learning.

The items with the lowest mean scores in the computer anxiety subscale were "I think that it takes a long time to finish when I use a computer" and "I think computers are easy to use." Strikingly, these items point to reduced productivity with regard to computer use. This can be addressed through improved computer training.

Overall, these findings are consistent with those of Yalcin et al. (2011) who reported that teachers who exhibit positive attitudes toward computer use are more likely to use computers in the classroom than those who do not. The low level of computer integration (Ertmer et al. 2012) in Dominican classrooms is a result of teachers' limited computing experience and skills (Hew & Brush 2007); limited access to computers (Fu 2013); and rigid timetables (Kopcha 2012). Moreover, the level of knowledge of best practices needed for the integration of computers in classrooms is a predictor of computer use within Dominican classrooms.

Successful computer integration in the classroom is, therefore, a function of the teacher's knowledge and skill to perform such an integration (Amante 2007); and, the level of training the teachers have received given that training provides considerable opportunities for successful integration (Ertmer et al. 2012).

The difference in attitudes based on age concurs with studies reported in the literature (Rana 2013; Mwila 2018). The significant differences recorded in computer enjoyment and computer anxiety between the 18-30 year old teachers and the over 40 year olds support the view that millennials are more tech-savvy than their older counterparts (Kumar et al. 2008; Rana 2013), given that the 18-30 year olds group was comprised entirely of millennials. There was not a significant difference in computer enjoyment or computer anxiety between the 18-30 year olds and the 30-40 year olds, however, which supports the findings of the Caribbean-based study by Walcott et al. (2013) which suggested that these age groups had similar levels of ICT skills.

CONCLUSION

This study examined Dominican primary school teachers' attitudes toward computers; the computer-based activities they undertook to enhance learning; and, the factors that hindered these teachers from frequently using computers for teaching and learning. Although the teachers demonstrated positive attitudes toward computers, it was realised that there was a significant effect of age on computer enjoyment and computer anxiety (computer attitudes). Younger teachers had a more positive attitude to computers than older teachers. Though teachers used computers to present PowerPoint presentations, type examinations, search for course content and create

worksheets, several barriers hindered their effective use of computers. These included inadequate technical support, inadequate training, a lack of computing resources and time restrictions for computer-based activities.

Further research needs to be conducted to determine the barriers to effective technology use at the secondary and tertiary educational levels in Dominica.

RECOMMENDATIONS

As highlighted by this study, the teachers in the primary schools under study only had enough knowledge and skills to integrate computers into their classrooms at a low-level. Despite this, teachers had a positive attitude toward computers and were desirous of integrating computers into their classrooms given the time, training and the necessary technical support. Given these factors, the following recommendations are proposed.

1. *Professional Development*. A professional development (PD) programme should be initiated where teachers attend ICT and instructional development training (in addition to other teacher training) and be awarded PD points. These PD points should then be linked to different forms of recognition including teaching awards, salary incentives and promotions. Given the differences in computer attitudes based on age, age specific training will be necessary.

   Regarding the teachers' assertion that they lack the time to learn and incorporate computers into their lessons, it is vital for schools to provide support that will encourage and motivate teachers to incorporate ICT. This support could include flexible classroom time and teacher substitution. When it is required for teachers to receive training, schools should ensure that the teachers have ample time to participate.

2. *Computing Resources*. Given the limited computing resources available within the classrooms, a "bring your own device (BYOD)" initiative should be started. The purpose of this initiative is to encourage teachers to bring their own devices into the classroom (as opposed to only using computers in the laboratories) and use these devices for teaching purposes. By assigning a single device to a group of students, more effective monitoring of technology use can be achieved. Other low-cost technological devices can also be employed in these classrooms, for example, student response systems.

   Also, the EMIS currently being used can further be exploited to store and share lessons plans and other learning resources. In like manner, open-source software (for example, code.org) can be utilised to better engage students with more computerised activities. With computers in the classroom, online collaborative learning can become a reality. Through group activities, teachers can use fewer computers to foster group activities among students, which encourages peer-to-peer interaction, increases students' motivation to learn, and improves students' learning (Hew & Brush 2007).

3. *Instructional Technology Support*. Teachers should have access to online and offline ICT and instructional development support. This support should be provided through an ICT champion assigned to each school, and who has been trained in the effective use of computers and instructional technologies.

4. *Computer Use Training*. Given the teachers' perceptions of the ease of use of computers and the time it takes to complete tasks using these devices, there is a need to provide training in basic computer skills and instructional technologies. These skills should include the use of productivity tools, hardware installation and securing a computer (Walcott et al., 2013), as well as the use of instructional technologies.

   It is paramount for teachers to be continuously learning with and about computers and, as such, guided assistance and in-house training should occur throughout the year and not only during one-off workshops and summer sessions.

5. *Teacher Partnerships*. Given that this study revealed a significant difference in computer enjoyment and computer anxiety between the millennial teachers and Baby Boomers/Gen-X teachers, partnerships should be established in an effort to infuse technology into the classrooms. These partnerships, supported by the ICT Champion, would help teachers to select and integrate appropriate technologies into the curriculum. This would be viewed as a win-win given that the millennials would have the opportunity to use technology and the Baby Boomers/Gen-X teachers the opportunity to improve their craft.

6. *Evaluation*. Finally, it is necessary to continuously evaluate the above approaches to ensure their efficacy. The approaches that work should be documented as best practice and shared.

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