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Stress, Affective Responses, and Coping Mechanisms of Canadian University Students Toward Online Learning During the COVID-19 Lockdown

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ABSTRACT

This study investigated the sources of stress, affective responses, and coping mechanisms among Canadian university students toward online learning during the COVID-19 lockdown. Based on a survey of 430 undergraduate and graduate students at a Canadian University in Ontario, Canada, it was found that a leading source of student stress is technology unreliability, followed closely by academic experience. The most frequent affective response is disaffection, particularly passive disengagement, as well as feeling distracted and unfocused. Problem-focused coping, especially seeking university help and self-organization, was the dominant approach followed by students in dealing with and trying to overcome the challenges associated with online learning. Institutional managers should dedicate resources to support online services, to offer student training in self-organization techniques, and to invest in reliable learning management systems. Instructors should clearly communicate their academic expectations and avoid ambiguity, encourage students to contact them directly, design course FAQ sections, and allocate extra time to accommodate unexpected technical glitches. Students should embrace the notion of technology unreliability, ambiguity, uncertainty, and other unexpected issues. It is their responsibility to arrange a productive learning environment at home, organize themselves, draw a line between school and home tasks, and secure formal or informal support if needed.

KEYWORDS

affective responses; coping; COVID-19; lockdown; online learning; student stress

Introduction

Despite the worldwide attempts to curb COVID-19, the disease still continues to have a significant effect on the functioning of post-secondary education across the globe (Charania, Bakshani, Paltiwale, Kaur, & Nasrin, 2021; Danyluk & Burns, 2021; ElHawary, Salimi, Barone, Alam, & Thibaudeau, 2021; Rehm, Moukarzel, Daly, & Del Fresno, 2021; Samoilenko, 2020; VanLeeuwen, Veletsianos, Johnson, & Belikov, 2021). Following government advice at the onset of the global pandemic, most universities temporarily discontinued in-person instruction and switched to online learning – a form of education that is delivered in a synchronous and/or asynchronous virtual environment through the use of various internet-enabled technologies that enhance interactivity and facilitate the learning process (Singh & Thurman, 2019). Overall, national closures have affected more than 91% of students worldwide (UNESCO, 2020).

On the one hand, from the students' perspective, online learning is not a new phenomenon because, prior to the COVID-19 lockdown, it had often been used alongside traditional forms of teaching, and students had been able to adopt online learning technologies, at least to some degree (e.g., see Coates, 2007; Tubaishat & Lansari, 2011). On the other hand, how students

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are grappling with online learning technologies in the era of the COVID-19 lockdown is still not fully understood (Hung et al., 2020). Against this backdrop, a key motivation for this study is that, while online learning is an important topic of investigation, as evidenced by its application and study in mainstream information systems (IS) journals, its focus in relation to COVID-19 is still at a nascent stage and much work remains to understand the impact of the pandemic on IS and, more specifically, e-learning. As noted by Jacks (2021, p. 93) "there is no question that the current emerging topic in IS research is COVID-related ... the pandemic has introduced new areas of IS research such as the use of contract tracing apps, COVID-19 infection dashboards, digital technologies to prevent the next pandemic, e-learning, and remote work."

On the surface, the rapid transition to online learning may signal wide-scale uptake by educational institutions across the globe; however, the extent to which e-learning systems and online video conferencing tools (e.g., Zoom, Microsoft Teams, Google Meet, Slack Video Calls) are meeting educational needs in the era of COVID-19 is still unclear. On the one hand, notwithstanding the devastating consequences that the pandemic continues to have on the educational sector, the increased uptake of online learning systems has extended the reach and diversity of locations where students can learn, reduced fuel costs and time spent traveling to campus, and increased the perceived safety and comfort of studying from home. At the same time, a growing number of studies have reported the dark side of online learning (Oliveira, Grenha Teixeira, Torres, & Morais, 2021; Paudel, 2020). After universities suddenly switched to an online learning mode, many students started to experience a myriad of problems and challenges (Toquero, 2020). University closures resulted in fewer educational opportunities, limited physical resources, home confinement, increase in mental disorders, and reduced well-being (Chen, Huang, Su, Štreimikienė, & Baležentis, 2021; Farooq, Laato, Islam, & Isoaho, 2021; Hodges, 2021; Kim, Merrill, Collins, & Yang, 2021).

One important global issue in the sudden move to online teaching and learning is student stress. A crisis event such as COVID-19 which is marked by uncertainty can bring heightened levels of stress and anxiety to students (Al-Rabiaah et al., 2020; Sahu, 2020). Li et al. (2020), for instance, in a study that examined 1,442 students at a Chinese University, found psychological distress and high acute stress reaction to be widespread among students. Huckins et al. (2020) illustrated that, overall, COVID-19 has had a negative effect on the emotional well-being of students in the United States, with many of them displaying symptoms of anxiety and depression. Similarly, Husky, Kovess-Masfety, and Swendsen (2020), in their study of French university students during COVID-19 confinement, reported that many experienced increased levels of anxiety and even moderate to severe levels of stress. What appears to be common is that stress levels among students intensified during the pandemic.

Despite attempts to shed some light on student-related stress issues during the COVID-19 outbreak, our understanding of the causes of stress, affective responses, and coping mechanisms as an outcome of the rapid transition to online learning remains an area to be explored in greater depth in all countries, including Canada (Clabaugh, Duque, & Fields, 2021; Hamadi et al., 2021; Huang et al., 2020; Ogan, Monk, Kanter, & Proulx, 2021; Reinhold et al., 2021). More specifically, much research needs to be undertaken to explore the influencing factors that have acted as sources of student stress (Prowse et al., 2021; Wang, Liu, Zhang, Xie, & Yang, 2021), as well as the positive and/or negative affective responses and coping mechanisms used by students during the COVID-19 lockdown (Baltà-Salvador, Olmedo-Torre, Peña, & Renta-Davids, 2021; Sustarsic & Zhang, 2022). Exploring these three areas (stress, affective responses, coping) together represents an important area of inquiry as it can facilitate a more comprehensive analysis – one that permits a deeper understanding of issues at play. Additionally, from a more practical viewpoint, remaining sensitive to potential stress points, moods, emotions, behaviors, and preferred coping mechanisms may enable institutional managers to align stress-reducing measures to student affective responses and coping needs. In summary, this study attempts to address the following research question:

What are the sources of stress, affective responses, and coping mechanisms associated with student online learning during the COVID-19 lockdown in Canada?

Using a content analysis approach, based on open-ended responses of 430 undergraduate and graduate students at a Canadian University, technology unreliability, closely followed by academic experience, was found to have a major impact on students, acting as a significant source of stress. Affective responses toward online learning during the COVID-19 lockdown were largely negative, with disaffection being the most common, particularly passive disengagement, as well as feeling distracted and unfocused. In terms of coping, problem-focused coping, mostly seeking university help and self-organization, was the dominant approach followed by students in attempting to overcome the impacts associated with the forced move to online learning.

This study makes several important contributions. First, it contributes to the literature by exploring the subjective experiences of students as they move from in-person to online teaching and learning during the lockdown, remaining mindful of technical and non-technical-related sources of stress, sensitive to both positive and negative affective states (feelings, emotions, and moods) and considering both problem-based and emotion-based coping mechanisms. Second, this investigation provides a fresh theoretical lens by building on a transactional-based theory of stress and coping drawing largely on the work in the field of psychology – a theoretical perspective that is often quoted without much refinement or explication in the IS/IT and e-learning literature. The theoretical lens considers individuals as part of a dynamic relationship with their environment. Stress is something constructed by students as they moved to online learning under the COVID-19 lockdown. Students engaged in stress appraisal, and in so doing, this influenced their stress response.

This article is organized as follows. This (first) section has already highlighted the study background. The next section reviews online learning as an important topic in IS/IT research, including literature related to stress, affective responses, and coping. This is followed by a discussion of the overarching research framework and research methods. The findings are then presented, and the implications and limitations of the study are outlined together with suggestions for future research.

Literature Review

Online Learning as an Important Topic in IS/IT Research

Online learning is an important topic in IS/IT research as illustrated by the growth in studies over the last several decades (Bian, 2009; Gao, Li, & Liu, 2021; Safavi, 2008). Previous projects have already examined online learning system features and properties (e.g., usability, quality, efficiency, robustness, and performance), and how they can impact user behavior and system outcomes (Dahleez, El-Saleh, Al Alawi, & Fattah, 2021; Eom, Ashill, Arbaugh, & Stapleton, 2012; Pituch & Lee, 2006). For instance, Eom, Ashill, Arbaugh, and Stapleton (2012) tested DeLone and McLean's (1992) model of IS success within a higher education online learning context and found that information quality and system quality can influence user satisfaction toward online learning. Pituch and Lee (2006) discovered three IT characteristics that are essential for e-learning systems achievement: response time, functionality, and interactivity. More specifically, poor response time due to slow internet connectivity; the inability to perform core functions (e.g., accessing quizzes, tests, and pedagogical material); and the lack of effective collaborative tools to facilitate effective interaction between learners and instructors (e.g., chat rooms and e-mail) can contribute to poor e-learning adoption.

While the technical aspects of online learning are an important area of IS/IT research, other studies (e.g., Chang & Tung, 2008; Jere, 2020) have focused on behavioral issues, user characteristics, and qualities that can impact online learning use and adoption. Examples of user characteristics and qualities include the competencies and abilities of users, user expectations, self-efficacy, perceived ease of use, and prior experiences of learners. One common model that has been applied to the study of online learning and IT use (Alamri et al., 2019; Salloum, Alhamad, Al-Emran, Monem, & Shaalan, 2019; Sukendro et al., 2020) is the Technology Acceptance Model (TAM) (Davis, 1989). Sinha and Bag

(2023), for instance, found that perceived usefulness and perceived ease of use had a direct impact on students' intention to use an online education system. In linking perceived social presence and cognitive absorption with TAM, Salimon, Sanuri, Aliyu, Perumal, and Yusr (2021) demonstrated that cognitive absorption and perceived social presence had a positive and significant effect on perceived ease of use, and an indirect influence on satisfaction and retention using an online learning platform. An important point raised in this body of work is that behavioral issues play an important role in influencing IS/IT use, and the extent to which an e-learning system is to be deployed effectively depends on how it is ultimately perceived by users.

Student Stress and Online Learning

One important behavioral issue that can influence online learning is student stress (Feiss et al., 2019; Gustems-Carnicer, Calderón, & Calderón-Garrido, 2019; Robotham, 2008). Lazarevic and Bentz (2021, p. 3), in relation to student online learning, define stress as the level of "subjective perception of mental and emotional tension experienced by students while participating in the educational process." Wang, Liu, Zhang, Xie, and Yang (2021, p. 550) refer to stress as "a condition or feeling experienced when a person perceives that the demands exceed the personal and coping resources the individual can mobilize." We will examine different conceptualizations of stress in more detail when discussing the overarching research framework. Although it has been acknowledged that stress, at low or moderate levels, can have a positive effect on memory recall and learning (Lazarevic & Bentz, 2021), heightened levels of stress can have a negative impact on student academic performance, and bring other unfavorable effects (Heinen, Bullinger, & Kocalevent, 2017; Rogowska, Kuśnierz, & Bokszczanin, 2020). Recent research (Mheidly, Fares, & Fares, 2020; Oducado & Estoque, 2021) has shown that students' stress associated with online learning has been exacerbated by the COVID-19 lockdown in many parts of the world. In examining online learning readiness and perceived stress among 1,145 university students in Bangladesh during the pandemic, Kabir, Hasan, and Mitra (2021) found that the move from campus-based teaching to online learning caused increased stress among students – ninety-one percent of students reported moderate to high stress levels. Similarly, Oducado and Estoque (2021), in a study of student stress among 108 undergraduate students during the COVID-19 pandemic in the Philippines, reported that 44.4% of students considered online learning as stressful, and 47.2% found the experience very stressful.

Heightened levels of stress linked to COVID-19 have prompted researchers to investigate the factors that cause stress. One body of work has examined the stress caused by rapid changes in technology by drawing on literature related to technostress (e.g., Brivio et al., 2018; Chen, 2015; Tarafdar, Tu, Ragu-Nathan, & Ragu-Nathan, 2007). The technostress literature has shown that there may be many factors that contribute to stress, including techno-overload, techno-invasion, techno-insecurity, techno-complexity, and techno-uncertainty. Often, researchers find it challenging to apply all, or take some combination, of the factors, to understand stress linked to online learning and COVID-19 (Christian, Indriyarti, & Wibowo, 2021; Schauffel, Kaufmann, Rynek, & Ellwart, 2022). Utilizing a technostress perspective, for instance, Al Abdullateef, Pasley, and Chesney (2021), in exploring the effects of using WhatsApp for online learning during COVID-19, found that information and communication overload and invasion of privacy led to the experiences of fatigue.

Another source of stress reported in the literature can be referred to as academic in nature. The sudden change from in-class learning to online delivery, lack of physical campus access, unclear academic expectations, reduced resource provision, the absence of social interaction with academics and fellow students, and concerns about academic performance have been some of the sources of stress reported in recent projects (Mushquash & Grassia, 2022; Varadarajan, Brown, Chalkley, & Hermes-Lima, 2021; Vrughese & Schwartz, 2022). A Canadian survey that examined 100,000 students revealed that more than 60% of them were very or extremely worried about the academic consequences of the pandemic, particularly about their grades and academic performance (Mushquash & Grassia, 2022). A further source of stress for students is financial related. Reduced income as a result of job loss or reduction in working hours, loss of spousal or parental income, and the perceived lack of

financial value of online learning and teaching due to COVID-19 are some of the issues noted (Islam et al., 2020; Lederer, Hoban, Lipson, Zhou, & Eisenberg, 2021). Other studies (e.g., Faize & Nawaz, 2020; Kalman, Macias Esparza, & Weston, 2020; Ouma, 2021) have reported home environment (e.g., living in close proximity to family members, home confinement, and distractions) as a major source of stress (Lazarevic & Bentz, 2021). Health-related issues, including sleeping problems, illness, and physical disability have also been a stress point referred to in recent studies (Akpınar, 2021; Chaturvedi, Vishwakarma, & Singh, 2021). While heightened levels of stress have been associated with the COVID-19 pandemic, and a variety of factors have contributed to this stress, the full range of influencing factors is still not yet fully clear and in need of further research (Prowse et al., 2021; Wang, Liu, Zhang, Xie, & Yang, 2021).

Affective Responses

Although some students exhibit positive affective responses (e.g., moods, feelings, and emotions) toward online learning during the COVID-19 lockdown (Espino et al., 2021) which result from reduced travel time to campus and the comfort/flexibility of studying from home, the majority of studies illustrate negative affective responses. A key concern arising from the literature is mental health issues (Baltà-Salvador, Olmedo-Torre, Peña, & Renta-Davids, 2021), particularly as a result of home confinement due to the lockdown. Lai, Au, and Low (2021), in a survey of 915 undergraduate students in Malaysia and Indonesia, examined the impact of online learning during the COVID-19 pandemic and found that students felt nervous and distressed when classes were conducted online. By analyzing student reflections during the Spring 2020 semester, Kee (2021) observed that graduate students encountered a range of emotional and psychological experiences. For instance, disappointment manifested itself in the form of students not being able to see colleagues in class and participate in graduation ceremonies. Students reported feelings of anxiety and fear due to the rapid transition to online learning, as well as perceived loss of power and control owing to not being able to physically meet with instructors in person. Besser, Flett, and Zeigler-Hill (2022), in comparing student reactions to online learning against face-to-face learning in Israel, reported that college students found the online learning environment to be less positive. In online learning, students also experienced higher levels of stress and isolation and lower levels of positive mood in terms of concentration, relatedness, focus, motivation, and performance.

In the case of Canada, many students have reported increased feelings of loneliness and disengagement (Cao et al., 2020; Ellis, Dumas, & Forbes, 2020. Kong (2021), in examining the attitudes of Canadian post-secondary students during the pandemic, found that 69% of them felt lonely, 77% were anxious, 63% expressed concerns about their health, and 79% were worried about the health of their loved ones. Hawke et al. (2020), in studying the effects of the pandemic on young people aged 14–28 in Ontario, identified growing mental health issues (i.e., self-harm, anxiety, and depression) during the first wave of the pandemic. Increased feelings of stress have been linked to greater symptoms of depression (Mushquash & Grassia, 2022). Vrughese and Schwartz (2022) administered a survey to 1,000 international students in Canada and found that approximately 50% of them were in danger of anxiety disorder and around 55% were at risk of depression. Through additional in-depth interviews with 25 respondents, Vrughese and Schwartz also found feelings of social seclusion, loneliness, panic attacks, and mental fatigue to be commonly reported by students.

As the preceding discussion reveals, many studies have framed their analysis around negative emotional states, and there is an increased need for studies to also consider both positive and negative emotions (Espino et al., 2021). Baltà-Salvador, Olmedo-Torre, Peña, and Renta-Davids (2021, p. 7414) note that "most studies during the COVID-19 pandemic on the emotional state of university students have only analyzed negative emotional states such as anxiety, stress, or depression. However, there is a lack of research with a more global perspective on the emotional state of university students that also includes positive emotions." Furthermore, although the focus of many studies is on student emotions, we feel that a more refined analysis of different types of affective states (i.e., emotions, moods, and feelings) would perhaps allow for a more penetrating account of the sentiments surrounding online learning.

Coping Mechanisms

The stress created by COVID-19 has also raised questions in terms of how individuals are effectively coping (Baloran, 2020). Responding to the pressures brought on by COVID-19, students have reacted to stress in various ways. In the case of the Philippines, Barrot, Llenares, and Del Rosario (2021) found that students deployed a range of strategies to overcome challenges associated with their online learning environment. These included resource management and utilization, help-seeking, technical aptitude enhancement, time management, and learning environment control. Examining the association between perceived stress and coping among undergraduate medical students in one region of Saudi Arabia, Abdulghani, Sattar, Ahmad, and Akram (2020), drawing on over 240 respondents, revealed that the most effective mechanism for coping with severe stress was practicing or engaging in religious activities. Other commonly used tactics included regular exercise, watching online games and movies, and taking part in fun activities with friends and family.

In investigating the coping strategies employed by 1,164 Canadian students during the COVID-19 pandemic, Ferguson et al. (2021) found that students employed two major forms of coping: (a) connecting online and outdoors, and (b) engaging in leisure and health-promoting activities. However, establishing in-person social connections among students proved to be extremely difficult because of a public health mandate on social distancing which dramatically reduced students' social engagement (Jeste et al., 2020). Due to several periods of long lockdowns, students often felt hopeless and could not develop effective emotion regulation strategies to reduce negative emotions and increase positive ones (Wang et al., 2021). As COVID-19 restrictions did not readily allow for physical interaction, connecting with others on the Internet and social media platforms (e.g., playing games, texting, video calls) was a way of staying connected and reducing stress. Getting outdoors (e.g., going for walks) was also noted as a positive coping strategy. Physical exercise and other activities (e.g., new hobbies, baking, cooking, arts, reading, and watching TV/movies) were also ways of dealing with stress (Ferguson et al., 2021). Prowse et al. (2021) who studied 366 undergraduate university students in Canada observed that the pandemic had a more marked impact on female students compared to males, particularly in relation to social isolation, mental health, and stress. Female students reported a higher level of negative impact due to COVID-19, mostly the issue of social isolation, and were more inclined to cope through the use of social media. By contrast, male students were more likely to cope through the use of substances such as nicotine, alcohol, and/or cannabis which are legal in Canada.

Regardless of the budding literature on coping strategies in the age of COVID-19 and online learning, research remains limited in this regard. We still do not have a thorough understanding of the coping strategies students are implementing to deal with the stress of COVID-19, particularly in the case of Canada. Further studies are required to explore these coping mechanisms in more depth (Sustarsic & Zhang, 2022), as well as the need for research methods that examine emotion- and problem-based coping using a qualitative lens (Masha'al, Shahrour, & Aldalaykeh, 2022).

Overarching Research Framework

Stangor and Walinga (2014) provide three useful ways in which stress can be conceptualized and applied in the broader stress literature: stimulus-based, response-based, and transactional-based. From a stimulus-based view, stress is characterized as a demanding pressure or event which evokes a particular reaction. Much of the focus is on stress as an independent variable that exerts or has the potential to wield an external force. The greater the external force, the larger the amount of stress placed on an object or a recipient.

A response-based conceptualization of stress emphasizes the physiological responses that occur when individuals are faced with an environmental event that is perceived as being stressful. For instance, Selye (1956), an endocrinologist, outlined a three-stage process in which the body responds when faced with a situation that is deemed threatening. Initially, when stress is encountered, the body responds with an alarm reaction which prepares the body for a fight or flight response (alarm stage). After reacting to the

stressor, the body attempts to deal with the new situation by returning to the default position whereby the body functions normally. This is referred to as the stage of resistance. Finally, if the stress continues, whereby the body does not have the energy to respond over the long term, fatigue sets in. This is referred to as the stage of exhaustion.

The transactional-based conceptualization moves beyond seeing stress as deterministic that follows a predictable path to realization. Instead, it posits that stress arises as the outcome of a dynamic transactional relationship between an individual and his/her environment, and this can influence how an individual appraises an event or situation. Stress can occur because of an imbalance between demands and resources (Lazarus & Folkman, 1984). Distress or some form of discomfort occurs if the demands of an event exceed perceived available resources. As a way of correcting or controlling this imbalance, the process of coping can take place. This study adopts the transactional-based conceptualization of stress because it emphasizes the situational and personal factors that can influence stress which helps researchers explore the process of coping with stressful situations.

Thus, the theoretical underpinnings of this study are influenced by the transactional theory of stress and coping (Lazarus & Folkman, 1984). Key concepts associated with the theory include stressor, primary appraisal, secondary appraisal, and coping response. How a person appraises a stressor (something that causes stress) influences how he or she will deal with or react to the stressor. The extent to which a stressor is upsetting to an individual is shaped by personal, contextual, or situational factors which impact the appraisal conditions experienced.

The theory acknowledges that individuals go through two key stages of appraisal: primary and secondary. Primary appraisal involves an assessment of whether an event poses a threat or challenge, and how relevant the event is for a person. Secondary appraisal is the process that occurs when one evaluates his or her ability (e.g., resources, social support, expertise) to cope with or take advantage of the negative situation. There are two types of coping: emotion and problem-focused. Emotion-focused coping involves an attempt to reduce or regulate the negative reactions connected to the stressors faced by an individual. By contrast, problem-focused coping, also commonly referred to as solution-focused coping, attempts to identify the source of the problem which is causing stress and actively find a possible solution to eliminate or alter the problem (Lazarus & Folkman, 1984).

Although prior research has investigated sources of stress and coping strategies using the tenets, or some variation, of the transactional theory of stress and coping, there is a need to explore further the affective responses (e.g., feelings, moods, emotions) (Poirel & Yvon, 2014; Sun et al., 2020), together with coping mechanisms during the COVID-19 lockdown. Furthermore, rather than treating stress as a variable that is to be objectively measured, it is critical to understand the opinions, perceptions, and experiences of different individuals, together with the context in which their sentiments are embedded (e.g., see Ching, Cheung, Hegney, & Rees, 2020). Devising an overarching research framework inspired by the transactional theory of stress and coping (Lazarus, 1999; Lazarus & Folkman, 1984), we focus on the causes of stress, affective responses, and coping mechanisms used by students when they were forced to move to online learning during the COVID-19 lockdown (Figure 1).

Methods

Focus of the Study

While the transition to online learning because of the COVID-19 lockdown has affected many countries, the focus of this study is specifically on Canada. In March 2020, in an attempt to curtail the spread of COVID-19, Canada introduced a number of health interventions, including stay-at-home orders and physical distancing measures (Ferguson et al., 2021). This rapid transition from, what can be perceived as, normal ways of working and daily activities to one of confinement and change has brought major disruptions to daily routines and practices, as well as student well-being and functioning (Prowse et al., 2021). The rationale for focusing specifically on Canada was due to the disruption that the lockdown had on students.

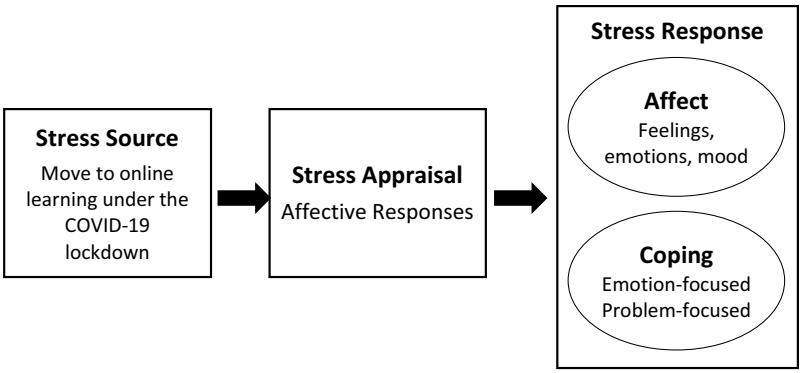

Figure 1. Overarching research framework.

Online Survey

An online survey was distributed to approximately 9,450 undergraduate and graduate students at a University in Ontario, Canada in July-August 2020. For this study, voluntary response sampling was used. This involved sending out the online survey to all students, and students had the opportunity to respond to the online survey. Thus, participation was completely voluntary. Students were provided with clear instructions about completing the online survey. In terms of ensuring the reliability and validity of the survey, face validity was established. This involved administering the questions to several experts in the topic area to check that the open questions were not misleading, confusing, or biased.

The province-wide lockdown was initiated in mid-March 2020 and all classes during the winter, spring, and summer semesters were moved online with virtually no advance warning. More specifically, students who took classes at the university during the COVID-19 lockdown (i.e., March-August 2020) were invited to take part. The students were informed about the purpose of the study – to understand their experience with and perceptions of online learning technologies when the university switched to an exclusively online mode of delivery.

For this study, online learning technologies included all communication and collaboration tools that students and/or their instructors employed for school-related purposes at the university, such as Blackboard, Kaltura, Moodle, Canvas, Zoom, Google Meet, Adobe, e-mail, Google Hangouts Chat, Slack, other video conferencing and messaging tools, and Digital Learning tools (WileyPlus, McGraw Hill Connect, and TopHat). In total, 497 responses were received at a response rate of 5%. This response rate is acceptable given that student response rates of 5%-10% are reliable provided that the sampling frame consists of at least 500 students (Fosnacht, Sarraf, Howe, & Peck, 2017). Due to missing data, however, the final sample consisted of 430 responses. The open-ended questions solicited responses on the following areas: key sources of stress in relation to using online learning technologies; affective appraisal of stress; and strategies for coping with stress. Closed-ended questions were included to capture the demographics of the participants.

Students were recruited using a university-wide e-mail campaign. Reminders were sent using the official university communication channels. By taking part in the survey, students had the chance to win one of 20 gift vouchers worth $20 CAN each. The survey took around 20 minutes to complete. The study was reviewed and approved by the university's Research Ethics Board.

Data Analysis

In the identification of themes, we adhered broadly to phases of thematic analysis proposed by Braun and Clarke (2006). As a way of ensuring trustworthiness and validity, the analysis process

was completed independently by two researchers. Dedoose (a qualitative analysis software) was used to manage, analyze and code the data. Both researchers were experienced in qualitative data analysis (content analysis). Phase 1 involved each researcher familiarizing themselves with the data by reading through the open-coded data of the survey findings and jotting down preliminary ideas. Phase 2 consisted of the initial code generation across the data set in a systematic manner. To assist with coding, literature relating to technostress was drawn on e.g., techno-overload, techno-invasion, techno-insecurity, techno-complexity, and techno-uncertainty (Tarafdar, Tu, Ragu-Nathan, & Ragu-Nathan, 2007); affection, moods, and emotions (McNair, Lorr, & Droppleman, 1971; Skinner, Furrer, Marchand, & Kindermann, 2008; Watson & Clark, 1999); and coping mechanisms (e.g., de la Fuente et al., 2020).

Keyword searches were particularly useful in the coding of affections, moods, and emotions. This included using the item composition of the PANAS-X scales (Watson & Clark, 1999) for identifying positive and negative affect, including the *General Dimension Scales* (Negative Affect [10[1]], Positive Affect [10]); *Basic Negative Emotion Scales* (Fear [6], Hostility [6], Guilt [6], and Sadness [5]); *Basic Positive Emotion Scales* (Joviality [8], Self-Assurance [6], and Attentiveness [4]); and *Other Affective State* (Shyness [4], Fatigue [4], Serenity [3], and Surprise [3]). To identify moods, McNair, Lorr, and Droppleman (1971) *Profile of Mood States (POMS)* was used to identify various types of moods. These mood states included words and themes relating to Anger [12], Tension [9], Fatigue [7], Depression [15], Vigour [8], and Confusion [7]. To identify engagement and disaffection behavior and emotions, Skinner, Furrer, Marchand, and Kindermann (2008) motivational conceptualization of engagement and disaffection in the classroom was used. This involved searching for words and themes related to Behavioral Engagement [10], Behavioural Disaffection [7], Emotional Engagement [7], and Emotional Disaffection [9]. The rationale for selecting these various scales and items was due to them being well established within the literature, but also not to restrict the analysis to just emotions and capture a diverse range of affections, emotions, and moods. Nevertheless, the coding process was still open-ended to allow for emergent themes.

Phase 3 involved grouping codes into possible themes. Influenced by the main research question of the study, three key themes were established: sources of stress, responses to stress, and coping mechanisms. Under each of these main themes, subthemes were created. The coding of themes and categorization of the data was a back-and-forth process. The themes created, in relation to the extracts that were coded, were reviewed and verified by the second coder (Phase 4) and when agreement was reached, they were named (Phase 5). Cross-rater checks were also performed by analyzing a sample of each researcher's codes. If inconsistencies were found, the codes were re-analyzed by the researchers until they could reach a consensus. Phase 6 involved producing a scholarly report by selecting exemplar quotes, linking the findings back to the literature, and answering the overarching research question.

Findings

Sample Overview

Twenty-nine percent of the students were between 20 and 21 years old, 20% were between 22 and 23 years old, 25% were older than 23, and 26% were younger than 20 years. Thirty-eight percent of respondents were men, 61% were women, and the remaining 1% did not identify their gender. Twenty-one percent were from business and information technology, 21% – health sciences, 19% – engineering and applied sciences, 16% – science, 13% – social science and humanities, 6% – education, 3% – energy systems and nuclear science, and 1% – interdisciplinary/across faculties. Ninety-one percent were undergraduate students, 7% were at the master's level, and 2% were at the doctoral level. Of the participants, 93% were full-time students.

Sources of Stress

Four themes representing the sources of stress were identified from the data: (1) technology (36.6%), (2) academic experience (34.8%), (3) students' environment (16.0%), and (4) personal issues (12.6%). Table 1 illustrates the themes, corresponding subthemes, and exemplar quotes.

Technology

Technology-related stress was illustrated through four sub-themes: technology unreliability, technology overload, technology uncertainty, and technology invasion. Technology unreliability, defined as unreliability due to technical malfunctions and unexpected system behavior, was the most frequently cited cause of stress. Examples of technology unreliability include internet glitches, slow internet connectivity, and performance issues with online learning platforms. Another stressor was technology overload – the feeling that the use of online learning technology forces more work/screen time and requires longer periods of time. Technology uncertainty, the situation where ongoing changes in technologies create unpredictability, was also a source of stress. Uncertainty was exemplified through the continuous changeover among multiple online learning platforms (e.g., Zoom, Google Meet, Adobe Connect, Kaltura) across different courses, frequent updates, and new system features. A further source of stress was technology invasion which refers to the feeling that technology invades students' personal space. The invasive nature of online technologies, particularly the need to download software applications, deemed intrusive, and the use of webcams for proctoring purposes created stress for some students.

Academic Experience

The second stress theme pertained to academic experience. This theme was further divided into six sub-themes: students' perceived inability to meet assessment deadlines/workload, inefficient communication with the teaching team, ineffective course coordination/structure, unclear academic expectations, a lack of classmate interaction, and other academic issues. A key cause of stress resulting from academic experience was the perceived inability of students to meet assessment deadlines or keep up with the academic workload. Inefficient communication with the teaching team also stressed students when they were unable, both synchronously and asynchronously, to reach the instructor or teaching assistant (TA) in a timely manner to ask questions, or when miscommunication issues were encountered. Stress also materialized due to issues associated with the instructor or TA in relation to ineffective course coordination/structure. Ambiguity around academic expectations in terms of assessment, tasks, and learning outcomes was also acknowledged as a stressor. A sentiment raised by students was that online learning, in comparison to in-person teaching, typically lacked classmate interaction, and subsequently was a stress point. Other academic issues were stress factors that were academic-related but did not fall neatly into the sub-themes. These, for example, included matters relating to school in general, concerns surrounding academic performance, and experiences of online groupwork.

Students Environment

The third source of stress pertained to the students' environment. Their home environment, including both the physical and social setting, was further sub-categorized into difficulty finding space to study, an inability to separate home and university life, and home life responsibilities. Whether living with other students or family, difficulty finding space to study (e.g., which resulted in experiencing noise and other disruptions) within the home environment was a key source of stress. As COVID-19 blurred the boundaries between the place where one lives and studies, it was difficult for students to separate home and university life, which became a cause of stress. For some, due to home life responsibilities, it was a struggle to manage or balance educational needs with other household commitments and chores. The environment surrounding the COVID-19 pandemic in general, as well as other

Table 1. Sources of student stress.

Theme	Subthemes	Exemplar Quotations
Technology (36.6%)	Technology unreliability (29.2%)	*Not knowing whether or not the technology would work properly caused more stress and more time, i.e., signing in early and making sure it's working properly, and you won't miss your class*. (P416)
	Technology overload (3.3%)	*It is hard to look at a screen all day, especially when you finish hours working on one course and realize you have four others you have to move onto*. (P169)
	Technology uncertainty (2.3%)	*Trying to remember which profs use which technologies and how they each differ, i.e., synchronous vs. asynchronous lectures, Zoom vs. Google Meets, etc*. (P191)
	Technology invasion (1.8%)	*I didn't feel comfortable that I was being watched through Respondus as it invaded my personal space*. (P361)
Academic experience (34.8%)	Students' perceived inability to meet assessment deadlines/workload (11.6%)	*I felt that there was more work to do, which caused a lot of stress. I ended up missing a lot of deadlines*. (P120)
	Inefficient communication with the teaching team (7.4%)	*Communication with profs and TAs was stressful, as there was a long wait period for replies and it was challenging trying to explain things over email as opposed to in person*. (P182)
	Ineffective course coordination/ structure (5.6%)	*Each instructor approached online learning technologies differently. Some were very fluent, meanwhile others were unsure of how to effectively use Adobe Connect. Class time was used up when professors had trouble with technologies, which caused me stress as I then had less class time to grasp the class lesson plan*. (P236)
	Unclear academic expectations (3.8%)	*My key sources of stress were not knowing the format of my exams, and my academic duties*. (P296)
	A lack of classmate interaction (0.8%)	*It leaned more towards not being able to interact with friends [classmates] to bounce ideas off of or troubleshoot problems with them*. (P378)
	Other academic issues (5.6%)	*The majority of stress I experienced was due to schoolwork in general*. (P177)
Student environment (16%)	Difficulty finding space to study (9.1%)	*The virus caused me to have to move back home, where both my parents work from home; this caused stress in finding somewhere to study and conduct online classes, which led to major stress*. (P84)
	An inability to separate home and university life (3.6%)	*The one key source [of stress] is the lack of separation between a classroom and my bedroom. Is it a place to relax? Is it a place to study hard? Is it a place to take my finals? I live in a dorm and have one room to eat, sleep, and study. The merging of schoolwork and study time with relaxation time makes it feel like all of the time is school time. That's what heavily contributes to my stress. I haven't been able to overcome that problem*. (P20)
	COVID-19 pandemic in general (1.3%)	*Key sources of stress were due to the external stresses from the novel coronavirus pandemic interacting with the intensity of the academic semester*. (P223)
	Home life responsibilities (1.0%)	*It was hard as I do not live alone and have home-related tasks to complete as well*. (P315)
	Other (1.0%)	*It's difficult to separate the stress that was a result of world events from the stressors that online learning imposed*. (P16)
Personal issues (12.6%)	Sudden change of routine (5.3%)	*Stress came from the uncertainty with changes happening so quickly*. (P132)
	Relearning (4.1%)	*Online learning required me to adopt to a new form of learning*. (P353)
	Resource constraints (2.0%)	*It was difficult to sit at home during a pandemic and concentrate on schoolwork when there were so many other stressors [such as] trying to find a source of income*. (P194)
	Health issues (1.2%)	*My mental health affected my levels of stress*. (P215)

environmental factors, for instance, social movements and other world events (coded as other), acted as an additional source of stress on top of the challenges of coming to grips with compulsory online learning.

Personal Issues

A fourth theme was connected to personal issues: factors related specifically to the individual. This was further divided into four sub-themes: a sudden change of routine, relearning, resource constraints, and health issues. The sudden change of routine almost overnight from traditional pedagogical practices and having to undergo a process of rapid relearning to adapt to online education were causes of stress for students. Stressors associated with resource constraints were classified as either financial or infrastructural. In terms of financial stressors, students mostly emphasized money issues directly (e.g., job loss because of the pandemic), but for some, the source was indirect in nature (e.g., a lack of money, as the student had to buy something to support online learning). Infrastructural stressors included a lack of appropriate furniture or equipment to support learning and studying. Health problems, particularly issues relating to mental health, were the underlying basis of stress for some students.

Stress Appraisal – Affective Responses

77.9% and 22.1% of affective responses toward online learning during the COVID-19 lockdown were negative (Table 2) and positive (Table 3), respectively.

Negative Affective Responses

Disaffection was the most commonly cited negative affective response, with many participants feeling disengaged, distracted, unfocused, inattentive, and that they were procrastinating. A closer examination revealed that two key sources of disaffection included the students' home environment (e.g., distractions, space restrictions, noise), and the online learning experience (e.g., its perception as long/monotonous, lacking physical/social interaction, and asynchronous). Apprehension was demonstrated through feeling uncomfortable, nervous, anxious, worried, panicky, and uneasy. Some of the key reasons for apprehension included the use of webcams or the lockdown browser for proctoring purposes, online assessment, presenting/speaking online, and the unpredictability of the online learning mode. Perplexity included uncertainty surrounding the class format/structure, feeling overwhelmed due to perceived increased workload and information overload, confusion about assessments and how to use the software, and difficulty retaining information. Even though the amount of material covered in each course was similar to that during in-person learning, it was the online form of instruction that created a feeling of perplexity.

A further negative reaction by students was that of feeling frightened. Being frightened manifested itself through technological troubles (e.g., software crashing, unstable internet connection), being judged or perceived as wrong when speaking out, family interruptions, and perceived concerns surrounding poor grade performance. Apathy was exemplified through disinterest and boredom and was linked to increased screen time, asynchronous learning, distractions, and a lack of physical interaction with online learning. Fatigue was also a negative response that students expressed. More specifically, respondents described feeling sleepy, tired, exhausted, drowsy, and drained. It was often attributed to the online learning experience in general and perceived workload, the need to maintain the same position for long periods of time, and too much screen time. Irritation was illustrated through sentiments of frustration, annoyance, and anger and was mostly linked to problems faced when using technology: e.g., shutting down unexpectedly and one's internet connection being too slow. In addition, unclear deadlines, challenges associated with groupwork, the need to use different learning platforms/tools across multiple courses, and studying from home were noteworthy sources of irritation. Due to home confinement and not having peers around, feeling lonesome (lonely or alone) was also a byproduct of the home confinement experience.

Positive Affective Responses

At the same time, not all students' affective responses were negative in nature. Of the positive affective responses, the feeling of friendliness, as illustrated through the online learning experience being

Table 2. Negative affective responses (77.9% of all affective responses).

Theme	Subthemes	Exemplar Quotations
Disaffection (42.2%)	Passive disengagement (15.0%) Distracted (14.5%) Unfocused (10.1%) Inattentive (1.8%) Procrastination (0.8%)	*I found myself more distracted when studying the video lectures or even in Google Meet lectures simply because I am at home and learning on my laptop, not in a classroom.* (P383) *I was not engaged a lot of the time because it was difficult listening to a voice recording for hours.* (P272)
Apprehension (13.8%)	Uncomfortable (8.1%) Nervous (2.5%) Anxious (1.6%) Worry (1.0%) Panicky (0.4%) Uneasy (0.2%)	*I don't like talking or showing my face through a webcam, and it gives me a lot of anxiety.* (P423)
Perplexity (5.5%)	Uncertainty about things (2.1%) Confused (1.6%) Overwhelmed (1.2%) Forgetful (0.6%)	*A lot of information was thrown at us all at once, making me feel overwhelmed.* (P362)
Fright (5.3%)	Fear (2.7%) Scared (1.4%) Afraid (1.2%)	*I wanted to turn on my mic and participate and ask a question, but I was too afraid of being judged or wrong.* (P213)
Apathy (5.1%)	Disinterest (4.1%) Bored (1.0%)	*To be quite frank, it [online learning] was boring. My professors with great personalities and teaching abilities were suddenly restricted to videos, and it felt like a dull learning experience.* (P133)
Fatigue (3%)	Sleepy (1.0%) Tired (1.0%) Exhausted (0.6%) Draining (0.2%) Drowsy (0.2%)	*Feeling drowsy from being in the same position for hours.* (P412)
Irritation (2.4%)	Frustrated (1.4%) Annoyed (0.6%) Angry (0.4%)	*When live, some of the technologies were lagging and slow, which is frustrating when you are in the middle of learning something new.* (P262)
Lonesomeness (0.6%)	Lonely (0.4%) Alone (0.2%)	*Not having peers around made it feel very lonely.* (P147)

Table 3. Positive affective responses (22.1% of all affective responses).

Theme	Subthemes	Exemplar Quotations
Friendliness (7.3%)	Helpful (7.3%)	*I could repeat a lecture, pause, rewind[,] etc. This was especially helpful for me because I am a visual learner.* (P373)
Engagement (7.1%)	Focus/attention (6.5%) Concentration (0.6%)	*The tools and resources made available for online learning have helped me as a student to be more focused.* (P271)
Joviality (3.1%)	Enjoyment (2.3%) Happy (0.6%) Excited (0.2%)	*I enjoy online learning, as it saves me commute time, and for a number of courses the way the content being taught online is not a huge change from the way it is taught in class.* (P263)
Serenity (2.2%)	At ease (1.0%) Calm/Peaceful (0.6%) Relaxed (0.6%)	*Learning online is great, it's peaceful at home, and I can understand better.* (P179)
Self-Assurance (1.4%)	Self-Confident (1.4%)	*I'm very confident when I use online learning technologies.* (P382)
Vigor (1%)	Active (0.8%) Energetic (0.2%)	*[In online learning] I was much more efficient with getting my work done and staying energetic. (P251)*

perceived as helpful (e.g., the ability to replay recorded lectures, interactive visuals and features, and the use of captions), was a leading response. Friendliness was closely followed by engagement (feeling focused/attentive and the ability to concentrate better in the online learning mode). Engagement was associated with the intrinsic features of online learning platforms (e.g., tools, functionality, resources) and the students' home environment, which, compared to in-person teaching, was considered to have fewer distractions. Joviality included enjoyment associated with not having to commute to campus and learning from home, being happy with the transition to online learning, and excitement about what future online learning would bring. Serenity – being at ease, calm, peaceful, and relaxed about online learning – was strongly linked to the students' home environment (i.e., the home was perceived as a quiet and safe place to study). Another common sentiment was self-assurance, particularly self-confidence in the use of online learning technologies and the perceived ability to perform well (academically) in the online environment. Being active and energetic (labeled as vigor) were also noted. More specifically, vigor was attributed to students' being actively immersed in the online experience (e.g., being active in discussions, forums, and chatrooms), as well as, compared to in-person teaching, feeling more energetic in the online mode of learning.

Coping Mechanisms

The findings revealed several coping mechanisms which were grouped into two key coping types: problem-focused coping (78.6%) and emotion-focused coping (21.4%). Problem-focused coping consisted of seeking university help, self-organization, distraction avoidance, and support from friends and family. Emotion-focused coping included self-regulation/self-control, passive acceptance, physical activity/hobby, and religion/spirituality (Table 4).

Problem-Focused Coping

Seeking university help was cited as a leading coping mechanism. This included communicating with academic staff and classmates, contacting the IT helpdesk, and requesting assistance from university support centers or services. The cultivation of habits that facilitate better forms of organizing (self-organization) also helped students reduce their feelings of stress. Examples of better organization included planning, note-taking, better prioritization, and time management.

As online learning, particularly working from a home environment, resulted in students becoming easily distracted, students engaged in several distraction avoidance techniques. Examples included a change of environment (using a different room or setting) and reducing interferences caused by

Table 4. Coping mechanisms.

Theme	Subthemes	Exemplar Quotations
Problem-focused coping (78.6%)	Seek university help (31.1%)	*I felt comfortable knowing I had friends from classes I could message/come in contact with over devices if I needed help with something.* (P89)
	Self-organization (26.2%)	*To overcome the workload stress, I would use a planner to organize and allocate assignments and readings to particular days.* (P167)
	Distraction avoidance (12.6%)	*I was able to overcome [family distractions] by going in my room and closing the door and letting my family know I was working.* (P366)
	Support from friends/ family (8.7%)	*I was able to overcome stress [of not having used the online learning platforms before] with practice and asking others who did not attend [the university] since I do not have many friends at the school itself.* (P310)
Emotion-focused coping (21.4%)	Self-regulation/self-control (8.7%)	*[Referring to the desire to play video games instead of doing schoolwork] I just persevered to overcome them.* (P61)
	Passive acceptance (7.8%)	*I do understand why we need online classes, and, while I do not enjoy them, I don't have another choice at the moment.* (P20)
	Physical activity/ hobby (3.0%)	*I made sure to get outside and do some activities that are beneficial to my mental and physical wellbeing.* (P131)
	Religion/spirituality (1.9%)	*My faith is a big part of my life so I was able to trust that by doing the right thing and not cheating will help me in the long run.* (P319)

smartphones and the internet. In addition to seeking help from the university, support from friends and family members outside the university acted as an important coping method.

Emotion-Focused Coping

Self-regulation/self-control involved attempting to control one's emotions, feelings, and thoughts in the face of disruptions. For instance, some students practiced self-reflection and perseverance to cope with the migration to online learning. Passive acceptance was a coping technique whereby an individual merely accepted the situation or problem. An underlying reason for this response was that participants felt they had no control over the current situation created by the pandemic and could do nothing to change it. Nevertheless, it helped them cope with the situation. A further way of coping was through physical activity or taking up a hobby. Exercise and hobbies were seen as conducive ways of improving mental well-being and reducing anxiety. The adherence to religious or spiritual practices and beliefs was also reported as a way to cope with stress and anxiety, particularly around the fear of accidental and unintended plagiarism/cheating.

Discussion

The purpose of this study was to understand the sources of stress, affective responses, and coping mechanisms associated with student online learning during the sudden COVID-19 lockdown in Canada. Figure 2 summarizes the key findings.

While, for some, the pandemic has provided feelings of ease, lower stress, reduced pressure, more time at home, and an opportunity for self-reflection and growth (Ferguson et al., 2021; Kong, 2021), students have encountered technological, academic, environmental, and personal issues and challenges (Cao et al., 2020; Ellis, Dumas, & Forbes, 2020; Vrughese & Schwartz, 2022). First, out of all sources of stress, the most striking factor was the unreliability of technology. This finding is consistent with that of several studies (e.g., Ayyagari, Grover, & Purvis, 2011; Butler & Gray, 2006; Fischer, Pehböck, & Riedl, 2019; Kalischko, Fischer, & René, 2020) that showed a positive association between the unreliable nature of technology and user stress levels. One explanation for the results found in this study was the undependable nature of the internet, in particular, internet interruptions and connectivity issues. While technological disruptions may initially appear trivial, when they occur regularly, haphazardly, and at critical points in time (e.g., during online exams/tests), the outcome can be heightened stress. This finding echoes prior research that also identified various unexpected IT problems as a major source of technostress, referred to as stress experienced by individuals as a result of their use of various information and communication technologies (Ragu-Nathan, Tarafdar, Ragu-Nathan, & Tu, 2008). On the one hand, it seems that many IT issues are impossible to predict and avoid. On the other hand, some of the key unreliability issues may be potentially identified and eliminated given the availability of time and resources. For example, an unreliable home internet connection may initially appear to be beyond students' control. However, it may be possible to switch to a different internet service provider that may have a more reliable service. The problem was a sudden move to the online learning mode which deprived students of an opportunity to try out different providers and select the most reliable one.

In addition to technology unreliability, some students experienced stress due to other technology-related issues, such as technology overload, technology uncertainty, and technology invasion (Al Abdullateef, Pasley, & Chesney, 2021; Christian, Indriyarti, & Wibowo, 2021; Schauffel, Kaufmann, Rynek, & Ellwart, 2022), which represented 7.4% of all stress sources in total. Again, this finding is consistent with those reported in the literature on the negative impacts of IT on users' mental state (Ragu-Nathan, Tarafdar, Ragu-Nathan, & Tu, 2008). This suggests that while the culprit of the unexpected lockdown and the switch to online learning is new (i.e., COVID-19), the key principles surrounding human-computer interaction processes remain the same.

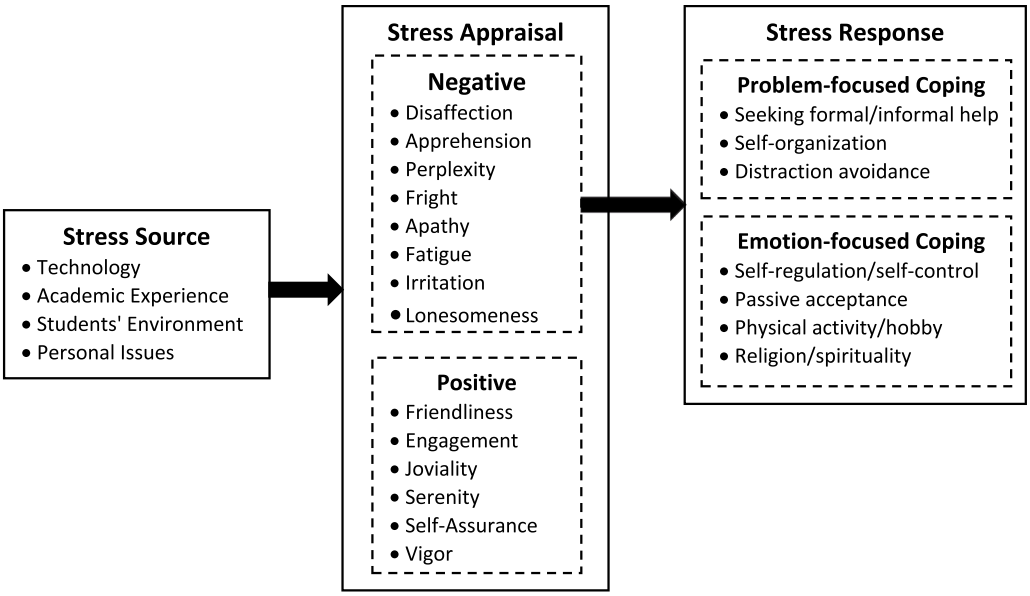

Figure 2. Students' stress, appraisal, and response to online learning under COVID-19 in Canada.

Second, academic experience is another major source of stress where most factors appear to be beyond direct students' control. The issues pertain to students' perceived inability to meet assessment deadline/workload, communication problems with the teaching team, ineffective course coordination/structure, and unclear academic expectations which create uncertainty – the situation involving imperfect or unknown information about the course. Our findings are consistent with numerous studies (Mushquash & Grassia, 2022; Vrughese & Schwartz, 2022) that have acknowledged academic-related issues as a significant source of online learning stress during COVID-19. While it is possible for students to deal with these issues in a reactive manner to reduce uncertainty (e.g., asking for clarifications, spending time to understand course structure, being persistent in communication), doing so requires additional mental power at the expense of other cognitive processes which creates stress. The observation above is consistent with neurobiology research which links uncertainty to stress (Peters, McEwen, & Friston, 2017).

Third, students' environment (finding space to study, inability to separate home and university life, and home responsibilities) and personal issues (sudden change of routine, relearning, resource constraints, and health issues) also place students under unnecessary stress. Most contemporary universities have learning commons and other various formal and informal learning spaces where students may study, work in teams, socialize, and relax (Woo, Serenko, & Chu, 2019). Depriving students of the use of these enjoyable and productive spaces breaks their study routine which causes stress. Moreover, many students do not have quiet and comfortable study spaces at home, especially given that many had to return to their parents' homes to save money on unnecessary accommodation. It becomes difficult or even impossible for some of them to separate school life from home chores which, again, results in stress (Azlan et al., 2020; Mahapatra & Sharma, 2021; Syahputri, Rahma, Setiyana, Diana, & Parlindungan, 2020). It is also possible that they become too distracted by social media during class time due to their technology addiction (Serenko & Turel, 2020) which stresses them further.

Fourth, it is not surprising that the affective responses were mostly negative, with passive disengagement (withdrawal from active online learning involvement) and feeling distracted (often due to the family and home environment) or unfocused (lack of online concentration) being the most cited responses. Several studies (Cao et al., 2020; Ellis, Dumas, & Forbes, 2020; Gandolfi, Ferdig, &

Kratcoski, 2021; Majumdar, Biswas, & Sahu, 2020; Odriozola-González, Planchuelo-Gómez, Irurtia, & de Luis-García, 2020) demonstrate the negative emotional effects of COVID-19 on students. One possible reason for disaffected behavior in general is that classroom-based teaching fosters the "norms of the classroom" (Lepp, Barkley, Karpinski, & Singh, 2019), whereby the physical presence of fellow students and instructors, as well as the explicit or implicit rules of the classroom (e.g., switching off cell phones, showing respect for the instructor, sitting through the entire class) can condition students to be more focused and attentive. Given that students do not always need to be visible or actively present during online learning, there may be more opportunities to multitask in non-academic activities, such as browsing social media, watching movies/TV shows, or spending time on smartphones and tablets. Consequently, these activities can foster a milieu more susceptible to detachment. Consistent with these findings, Schifano, Clark, Greiff, Vögele, and D'Ambrosio (2023) report that working from home negatively impacts employee wellbeing. Nevertheless, there is evidence that students may perform better under online learning conditions than in traditional face-to-face classroom settings (Iglesias-Pradas, Hernández-García, Chaparro-Peláez, & Prieto, 2021).

At the same time, not all students developed negative affective responses to online learning under the COVID-19 lockdown. Unexpectedly, a smaller yet noticeable fraction of students reported feelings of friendliness, engagement, joviality, serenity, self-assurance, and vigor. It is possible that some students have a home environment, possess a unique learning style, exhibit certain personality characteristics conducive to online learning, and, as a result, experience positive emotions. This suggests that online learning may be a potentially enjoyable activity that will benefit many students (Akuratiya & Meddage, 2020; Surani & Hamidah, 2020).

Fifth, this study confirmed the efficacy and applicability of the transactional theory of stress and coping (Lazarus & Folkman, 1984) in the COVID-19 environment. Consistent with this theory, two categories of stress responses were identified: problem-focused and emotion-focused. Problem-focused coping was the main mechanism used by students to deal with stress. Seeking help from either inside or outside the university (through support from friends and family) has been acknowledged as a way of addressing the effects of anxiety and stress (Banerjee, 2020; Son, Hegde, Smith, Wang, & Sasangohar, 2020; Wang, Zhang, Zhao, Zhang, & Jiang, 2020). Support is a key factor in promoting both psychological and physical well-being, with the negative repercussions of a lack of support being well recognized (Fenlason & Beehr, 1994; Ozbay et al., 2007). In terms of self-organization, one possible explanation may be given that the human brain is only able to process a limited amount of information at any given time (cognitive load theory). The sudden and traumatic nature of a pandemic may force students to have to deal with multiple events and tasks simultaneously. Better organization and planning can be seen as ways of dealing with unpredictability, promoting positivity, and reducing the effects of stress (Morgan, 2020; Polk, Smith, Zhang, & Neupert, 2020).

The fact that the problem-focused coping strategy was four times as popular as the emotion-focused coping is very encouraging. Problem-focused coping is directed at addressing the problem associated with the cause of stress and finding ways to minimize or eliminate its impact while emotion-based coping does not specifically deal with the root of the issue. Particularly discouraging is the passive acceptance coping strategy reported in 8% of all cases where students merely accept their desperate fate instead of looking for potential solutions. Such an approach, however, may only exacerbate the problem in the future. In a similar vein, Herman and Tetrick (2009) show that emotion-focused coping strategies worsen people's work adjustment while positive ones improve it. Another encouraging fact is that students develop positive emotional responses to their online learning environment. This means that, if done right, online learning may eventually become a truly enjoyable experience.

Theoretical Contributions

This study offers several important theoretical implications. Although a growing body of work has examined stress and coping by taking a transactional-based theoretical perspective, fewer studies have

used the theory to explore stress, affective responses, and coping during the COVID-19 lockdown in the Canadian university context. This study contributes to the body of knowledge by examining sources of student-related stress, affective responses, and coping mechanisms. As this study illustrates, students can have various experiences with technology, schooling, their environment, and other personal issues that can act as a stimulant for stress. In terms of stress appraisal, a crisis, as in the case of the COVID-19 lockdown, can be seen as positive or negative; however, our findings reveal the latter to prevail. A further contribution of the study is an attempt to offer a more detailed account of affective responses – one that does not solely focus on a single type of response, e.g., emotions, but also considers affect and mood, nor limits the analysis to just positive or negative. How students appraise the situation can also influence how, and if, they respond to or cope with the situation. The study adds to our understanding of coping by exploring both the emotion- and problem-focused strategies used by Canadian students to deal with the COVID-19 lockdown.

International Implications

While the issues explored in this study are critical in Canada, they may also be important in other countries. Thus, an important question is: How do the findings of this study compare with those reported in other international studies focusing on COVID-19 and online learning? One key theme which emerged from this investigation was technology unreliability as a key source of stress, particularly problems associated with internet connectivity. A closer examination of the literature revealed poor internet connectivity to be a significant disruption to the student online learning experience during the COVID-19 pandemic in developing countries, including, for example, Iraq (Tuma, Nassar, Kamel, Knowlton, & Jawad, 2021), Indonesia (Rahiem, 2020), the Philippines (Baticulon et al., 2021), and some African countries (Oladipo et al., 2020). The present study shows that issues with unreliable internet connectivity and the availability of technology for online learning purposes are not limited to developing countries. In fact, these issues still present complications for students living in developed countries, particularly those residing in rural communities.

Our study revealed that students' affective responses toward online learning during the COVID-19 lockdown are mostly negative in nature. From an international perspective, this coincides with a growing number of studies that illustrate the largely adverse effects of COVID-19 restrictions on students' affective behavior. For instance, Kirby et al. (2021) who conducted a cross-country study examining appraisal activities during COVID-19 across 12 countries – Bangladesh, Bulgaria, China, Colombia, India, Israel, the Netherlands, Norway, Peru, Portugal, Turkey, and the United States – found that disengagement behavior was associated with negative outcomes. This finding is supported by other international studies (e.g., Cifuentes-Faura, Obor, To, & Al-Naabi, 2021; Tasso, Hisli Sahin, & San Roman, 2021) which also acknowledge disengagement behavior to be more noticeable during the pandemic. The shift to the online learning mode has brought with it greater opportunities for distractions (Bawa'aneh, 2021), as observed in the present study and also in other developed countries, including the United Kingdom (Walters, Simkiss, Snowden, & Gray, 2022) and the United States (Wallace, Schuler, Kaulback, Hunt, & Baker, 2021). For instance, many Canadian students feel unfocused, similar to their international counterparts. The same conclusions have been reached by studying students in Israel (Savitsky, Findling, Ereli, & Hendel, 2021) and Bangladesh (Abdelrahim, 2021).

While the findings of this study illustrate the dominant form of coping to be problem-focused, studies have been mixed with regard to the strategies used by students to navigate the pandemic. On the one hand, Falasifah, Fitria, and Hakim (2021), in a comprehensive literature review of coping strategies among college students across the globe during the pandemic, revealed the major coping strategy adopted by students was problem-focused coping, mostly seeking social support from university, friends, and family members. Huang et al. (2020), in the case of nursing college students in China during COVID-19, found that respondents employed problem-focused approaches more often than emotion-based strategies. By contrast, Madrigal and Blevins (2022), based on a survey of 585 respondents from the United States,

found that emotion-focused coping strategies were predominately used. However, they also recognized that students typically engage in a range of coping mechanisms. Talukdar and Mete (2021), in their study of mental health issues experienced by 384 undergraduate students in West Bengal, India during COVID-19, found emotion-focused coping, compared to problem-focused and avoidance coping strategies, to be mostly adopted by students. It is possible that the selection of a coping mode is country or region-specific which warrants further empirical research.

Implications for IS/IT Management

Based on a reflection of findings, this study raises a number of important implications for IS/IT management. It may be too late to fix the mistakes made during the first weeks of a sudden switch to the online mode of delivery. However, it is prudent to learn from this experience because the long-term trajectory of this devastating disease is largely unknown and future lockdowns are still possible. As universities across the globe, due to COVID-19 preventative measures, have become more reliant on IS/IT for their business operations, our study highlights the importance of good contingency planning. Contingency planning needs to be given priority and integrated with the overall strategic planning process. Managers, where possible, should be attentive to existing organizational constraints, capabilities, and resources and anticipate likely problems, challenges, and obstacles when adopting new e-learning and collaborative tools. If an institution anticipates high levels of student stress, minor adjustments to online technologies (e.g., the use of a single learning platform, the curtailment of non-essential software updates/modifications) and using an incremental approach, where possible, should be adopted.

While the selection of an instructional mode during an unexpected emergency lockdown is beyond the control of university administration, administrators may take several proactive steps to reduce students' stress levels. Because technology unreliability is a major source of stress, administrators need to engage with their university's IT center to conduct an audit of the available remote learning systems with the goal to identify the most unreliable IT tools or functions and either fix or discontinue them. When selecting technology, it is important to classify and rank systems based on pedagogical requirements and conduct an impact analysis to assess risk. The focus should be not only on costs but also on reliability, availability, and accessibility. This is particularly important as echoed from our findings that robust systems and infrastructure are necessary to provide effective and reliable service provision during a crisis event. New technologies and systems, where possible, should be adopted with time. Since many organizations and universities have already software agreements in place, it may be more viable to use a system that university stakeholders are accustomed to, as well as using a reliable "tried and tested" software solution. Managers should consider very carefully which IT solution is the best choice for the needs of the organization and always approach the issue from the students' perspective.

Appropriate time and investment need to be provided to allocate appropriate resources for technical support, proper training, and support services, including psychological and stress management support. Online student training in self-organization techniques (e.g., planning, effective note-taking, time management skills) should be considered. University administration should also invest in faculty training to ensure that all instructors are comfortable with delivering their courses online. For example, as a first step, new faculty may be encouraged to deliver some of their courses in a blended format to become familiar with an online learning environment and shadow the online courses delivered by senior faculty.

Institutional managers must be open and sensitive to emergent constraints both during and after a crisis. While features of unreliable technology cannot always be predicted and avoided (e.g., unanticipated glitches, slow internet connectivity, performance issues, potential vulnerabilities), these may be lessened or eliminated by appropriate technical, management, and operational solutions as part of an organization's contingency planning or risk management efforts. Evaluation, monitoring,

and feedback mechanisms should be put in place to flag any potential issues allowing for early warning sign detection. For warning detection to be effective, instructors, students, administrators, and managers need to work together in synergistic ways.

Implications for Instructors and Students

Course instructors should clearly communicate their academic expectations and avoid ambiguity. Online communication flows are less effective and efficient than those during in-person interaction. During in-person course delivery, students often stay after class to discuss course matters or drop by their instructor's office during office hours. While it is also possible to hold virtual office hours, some students may hesitate or find it inconvenient to do so online. Thus, instructors should encourage students to contact them if ambiguity arises. Course FAQ sections may also serve as an effective informational tool.

Instructors should be sensitive to the technical constraints faced by students taking their online courses. If alternative forms of assessment to synchronous exams/tests are not a viable option, extra time should be provided to accommodate technical glitches and other unexpected system behavior. Where possible, students should be given ample time to download online resources well in advance of classes. During pandemics and other crisis events, students may simply not know with certainty what to expect; thus, clear and frequent communication should be provided to update and remind them of important course information, events, or changes. During online classes, students should be provided with more frequent breaks to facilitate engagement and attentiveness. Instructors should also be realistic in their workload expectations; for instance, assessments should be communicated to students as early in the term as possible and should be realistically achievable during a pandemic situation.

Despite the best effort of administrators and faculty, it is impossible to completely remove all factors contributing to students' stress. Thus, students should embrace the notion of technology unreliability, ambiguity, uncertainty, and other issues associated with online learning. At the end of the day, it is their responsibility to arrange a productive learning environment at home, organize themselves, draw a line between school and home tasks, and secure formal or informal support if needed. For example, they should practice distraction-avoidance techniques such as turning off phones and logging out of social media when the class starts. In other words, students should create a mindset of problem-focused coping to receive the best possible education given the environmental constraints.

Limitations, Future Research Directions, and Conclusions

It is important to recognize the limitations of this study, as well as areas for further examination. First, the results are based on a single university in Canada. Thus, it cannot be claimed that the findings and implications are generalizable to other universities. Nevertheless, as many universities in Canada and across the globe have rapidly transitioned to online learning and many students have been confined to their home spaces, the findings may be useful to other educational institutions. Further projects are needed to test and confirm the results of our study. Second, in the coding of data, we largely adopted specific keywords in the identification of affection, moods, and emotions, but other types of sentiments may be overlooked. Third, longitudinal methods could have been used to assess stress, emotions, and coping over time. For instance, it may be the case that stress and negative feelings decline as students become more acclimatized to online learning throughout a pandemic. Fourth, the focus of the study has been on online learning technologies in general. Perhaps specific technologies embody particular patterns of stress, affective responses, and coping. This was not investigated in this study. Fifth, this study did not consider whether any students taking part in this investigation had any underlying health conditions or whether they had used the university counseling services during the COVID-19 lockdown. Sixth, we did not use statistical measures or procedures to explore the relationships between variables.

Last, this study solely focused on students. At the same time, course instructors and university administrators may provide a different perspective on the phenomenon of interest and show how to proactively reduce the sources of students' stress. Thus, we recommend that future scholars include course instructors in their studies. With regard to future projects, it is also important to understand further how and why situational factors – age, gender, culture, and personal interests, among others – prompt different types of stressors, affective states, and coping mechanisms. Future scholars may find it interesting to explore the impact of the Great Resignation (Serenko, 2023a) and quiet quitting (Serenko, 2023b) on students' sentiment toward online education and the value of online learning.

The purpose of this study was to analyze the sources of stress, affective responses, and coping mechanisms used by students during lockdown because of COVID-19. In summary, the findings reveal technology (especially its unreliable nature) to be a major source of student stress. Disaffected behavior – particularly passive disengagement and feeling distracted and unfocused – were the most common affective responses shared by participants. Seeking university help and self-organization (problem-based coping) were the most common strategies they adopted. Based on the results, we provide several key learning points and practical recommendations in relation to student online learning during the COVID-19 lockdown.

Note

1. Number indicates the number of corresponding words. For instance, Negative Affect [10] consisted of the following word items: afraid, scared, nervous, jittery, irritable, hostile, guilty, ashamed, upset, and distressed.

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