SINIRSIZ EĞİTİM VE ARAŞTIRMA DERNEĞİ

Sınırsız Eğitim ve Araştırma Dergisi

Eğitim ve Araştırma Education and Research

The Journal of Limitless Education and Research

Temmuz 2024
Cilt 9, Sayı 2

July 2024
Volume 9, Issue 2

The Journal of Limitless Education and Research

July 2024, Volume 9, Issue 2

Sınırsız Eğitim ve Araştırma Dergisi

Temmuz 2024, Cilt 9, Sayı 2

İletişim
Sınırsız Eğitim ve Araştırma Derneği
06590 ANKARA – TÜRKİYE
e-posta: editor@sead.com.tr
sead@sead.com.tr

Contact
Limitless Education and Research Association
06590 ANKARA – TURKEY
e-mail: editor@sead.com.tr
sead@sead.com.tr

Sınırsız Eğitim ve Araştırma Dergisi (SEAD), yılda üç kez yayımlanan uluslararası hakemli bir dergidir.
Yazıların sorumluluğu, yazarlarına aittir.

Journal of Limitless Education and Research(J-LERA) is an international refereed journal published three times a year.
The responsibility lies with the authors of papers.

Kapak: Doç. Dr. Ayşe Derya IŞIK-Doç. Dr. Barış ÇUKURBAŞI

The Journal of Limitless Education and Research, Volume 9, Issue 2

Sınırsız Eğitim ve Araştırma Dergisi, Cilt 9, Sayı 2

İNDEKSLER / INDEXED IN

The Journal of Limitless Education and Research, Volume 9, Issue 2

Sınırsız Eğitim ve Araştırma Dergisi, Cilt 9, Sayı 2

The Journal of Limitless Education and Research, Volume 9, Issue 2

Sınırsız Eğitim ve Araştırma Dergisi, Cilt 9, Sayı 2

The Journal of Limitless Education and Research, Volume 9, Issue 2

Sınırsız Eğitim ve Araştırma Dergisi, Cilt 9, Sayı 2

The Journal of Limitless Education and Research, Volume 9, Issue 2

Sınırsız Eğitim ve Araştırma Dergisi, Cilt 9, Sayı 2

The Journal of Limitless Education and Research, Volume 9, Issue 2

Sınırsız Eğitim ve Araştırma Dergisi, Cilt 9, Sayı 2

The Journal of Limitless Education and Research, Volume 9, Issue 2

Sınırsız Eğitim ve Araştırma Dergisi, Cilt 9, Sayı 2

The Journal of Limitless Education and Research, Volume 9, Issue 2

Sınırsız Eğitim ve Araştırma Dergisi, Cilt 9, Sayı 2

Bu Sayının Hakemleri (Referees of This Issue)

The Journal of Limitless Education and Research, Volume 9, Issue 2

Sınırsız Eğitim ve Araştırma Dergisi, Cilt 9, Sayı 2

Dear Readers,

We are delighted to present you the July 2024 issue of the Journal of Limitless Education and Research.

The aim of our Journal, which has been continually published by the Limitless Education and Research Association (LERA) for 8 years since 2016, is to contribute scientifically to the field of education and research. To this end, theoretical and applied original studies are published for free and shared with readers at nationwide and worldwide.

The Limitless Journal of Education and Research is published in Turkish and English three times a year and indexed in EBSCO, Education Full Text (H. W. Wilson) Database Coverage List, which is accepted as a field index by the Higher Education Council (UAK in Turkish). Additionally, it is indexed in various national and international indexes such as ASOS, DRJI, ESJI, OAJI, ROAD, SIS, SOBİAD, Worldcat, and receives numerous citations. To the SOBİAD impact factor, our journal is in the top 90th among scientific journals in our country. Our initiatives and studies continue so as to let our journal be scanned in national and international indexes.

SEAD Journal, an internationally peer-reviewed journal, is published with scientific contributions of articles, research, and projects by academics, researchers, educators, and teachers from different countries. Our journal has been maintaining its publication for eight years without compromising its academic and scientific quality, delivering current and new studies to readers in the field.

In this issue of our journal, five scientific research and articles related to education are included. We would like to thank all the editors, authors, reviewers, and translators who contributed to the preparation and publication of this issue.

We extend our respect with the hope that our journal will contribute to scientists, researchers, educators, teachers, and students in the field.

LIMITLESS EDUCATION AND RESEARCH ASSOCIATION

The Journal of Limitless Education and Research, Volume 9, Issue 2

Sınırsız Eğitim ve Araştırma Dergisi, Cilt 9, Sayı 2

Değerli Okuyucular,

Sizlere Dergimizin Temmuz 2024 sayısını sunmaktan büyük mutluluk duyuyoruz.

Sınırsız Eğitim ve Araştırma Derneği (SEAD) tarafından 2016 yılından bu yana 8 yıldır kesintisiz olarak yayınlanan Dergimizin amacı, eğitim ve araştırma alanına bilimsel yönden katkı sağlamaktır. Bu amaçla kuramsal ve uygulamalı özgün çalışmalar ücretsiz yayınlanmakta, ulusal ve uluslararası düzeydeki okuyucularla paylaşılmaktadır.

Sınırsız Eğitim ve Araştırma Dergisi (SEAD), yılda üç sayı olarak Türkçe ve İngilizce yayınlanmakta, ÜAK tarafından alan indeksi olarak kabul edilen EBSCO, Education Full Text (H. W. Wilson) Database Covarage List'te taranmaktadır. Ayrıca ASOS, DRJI, ESJI, OAJI, ROAD, SIS, SOBİAD, Worldcat gibi ulusal ve uluslararası çeşitli indekslerde taranmakta ve çok sayıda atıf almaktadır. SOBİAD etki faktörüne göre Dergimiz, ülkemizdeki bilimsel dergiler içinde ilk 90. sırada bulunmaktadır. Dergimizin ulusal ve uluslararası indekslerde taranabilmesi için girişimlerimiz ve çalışmalarımız devam etmektedir.

Sınırsız Eğitim ve Araştırma Dergisi (SEAD), uluslararası hakemli bir dergi olmakta, farklı ülkelerdeki akademisyen, bilim insanı, araştırmacı, eğitimci ve öğretmen yazarların makale, araştırma, proje gibi bilimsel katkı ve destekleriyle yayınlanmaktadır. Akademik ve bilimsel kalitesinden ödün vermeden sekiz yıldır yayın hayatını sürdürmekte, güncel ve yeni çalışmaları alandaki okuyuculara ulaştırmaktadır.

Dergimizin bu sayısında eğitimle ilgili beş bilimsel araştırma ve makaleye yer verilmiştir. Bu sayının hazırlanması ve yayınlanmasında emeği geçen bütün editör, yazar, hakem ve çevirmenlere teşekkür ediyoruz.

Dergimizin alandaki bilim insanı, araştırmacı, eğitimci, öğretmen ve öğrencilere katkılar getirmesi dileğiyle saygılar sunuyoruz.

SINIRSIZ EĞİTİM VE ARAŞTIRMA DERGİSİ

The Journal of Limitless Education and Research, Volume 9, Issue 2

Sınırsız Eğitim ve Araştırma Dergisi, Cilt 9, Sayı 2

TABLE OF CONTENTS

İÇİNDEKİLER

The Journal of Limitless Education and Research
Volume 9, Issue 2, 219 - 234

https://doi.org/10.29250/sead.1407311

Received: 20.12.2023 **Article Type:** Research **Accepted:** 22.05.2024

Turkey-based Civil Engineers' Intentional Informal Learning Experiences during the COVID-19 Pandemic

Assoc. Prof. Dr. Tanju DEVECİ, Antalya Bilim University, tanjudeveci@yahoo.com, 0000-0001-5905-9793

Prof. Dr. İdris BEDİRHANOĞLU, Dicle University, ibedirhanoglu@dicle.edu.tr**,** 0000-0001-6852-3041

Abstract: The COVID-19 pandemic served as a disjuncture causing individuals to seek various learning opportunities, including intentional informal learning (IIL). This study investigated 190 Turkey-based civil engineers' IIL experiences influenced by the pandemic. Data were collected using a survey with close- and open-ended questions. Results revealed that the participants' overall IIL engagement was at a moderate level, trying to compensate for the lack of information and skills deemed essential, most of which were job-related. Although they also indicated general interest-related IIL activities, these were still related to work. Results also showed that the participants normally used internet-based learning sources and had a tendency toward communicative and collaborative IIL activities. Based on the results, training programs for civil engineers are recommended to emphasize the notion of IIL and create communicative and collaborative learning opportunities in virtual and non-virtual environments.

Keywords: Civil engineering, COVID-19, Disjuncture, Informal learning, Intentional informal learning, Lifelong learning.

Cited in: Deveci, T. & Bedirhanoğlu, İ. (2024). Turkey-based civil engineers' intentional informal learning experiences during the COVID-19 pandemic. *The Journal of Limitless Education and Research, Sınırsız Eğitim ve Araştırma Dergisi, 9*(2), 219-234. https://doi.org/10.29250/sead.1407311

1. Introduction

The interconnectedness of life and learning is a central axiom, with the emphasis being placed upon ubiquitous learning opportunities embedded in every domain of our lives. This underscores the significance of 'informal learning' (IL) that often takes place outside formal education. This is particularly the case for individuals who have completed their formal education and embarked upon a professional career.

Albeit variations due to its being such a broad concept, a popular definition of IL is "learning resulting from daily activities related to work, family or leisure and is not organized or structured in terms of objectives, time or learning support" (EU Council, 2012, p. 5). Similarly, Livingstone (2006, p. 204) defines it as "all forms of intentional or tacit learning in which we engage either individually or collectively without direct reliance on a teacher or externally organized curriculum." The notion of 'intentionality' is central to the definition adopted in the current paper. Intentionality indicates that the individual is conscious that learning is taking place; it is not tacit or incidental. That is, the individual knows what he/she needs to learn and engages in intentional learning activities individually or with others. This learning does not lead to a formal certification.

IL has been noted to develop individuals' cognitive development (Scribne & Cole, 1973; Thomas, 2002) along with their lifelong learning (LLL) skills (Pozgaj, 2008; Golding et al., 2009). The latter is of particular importance for engineers in general and civil engineers in particular, which is the focus of the current study since their professional development is heavily based on continuous updating of skills and knowledge. LLL skills for engineers are also essential so they can cope with the difficulties of life and fulfill themselves as individuals. So much so successful engagement in LLL is as much a requirement for professional development as it is a requisite for holistic development. Thus, being attuned to different ways of learning that support LLL is imperative, and one way is IL, the importance of which is underscored by Fisher et al. (2019) in the following way:

> *"Learning in all parts of an individual's life course is essentially an unbounded activity, one that frequently takes place beyond institutions — this is especially the case in the twenty-first century where information technologies enable individuals and groups to freely access existing (and create new) knowledge. (pp. 8-9)"*

Although the ways in which individuals perform IL activates may vary, one commonly occurs in online environments, mainly due to the ever-increasing role of technology in our lives. Yu et al. (2021) states that online IL is without structured content and learning is based on observation and imitation, cooperation and communication, and personal reflection. Accordingly, it is greatly unplanned and personalized. Similarly, Lai (2017) points to the role of the Internet providing ample opportunities for searching information to solve problems at hand. Indeed, previous research found that IL occurring on the Internet has positive effects on individuals' learning and decision-making processes (Huang & Oh, 2016).

The Internet also allows for collaborative learning opportunities. Keese (2011) notes that due to the number of interactive Internet-based tools and applications, individuals are now more able to create and use interactive features, allowing them to create their own online IL communities where they can cooperate with those who have similar interests and needs. This aspect of online IL makes it purposeful and intentional. Other scholars have also pointed out the value of other types of online resources. Lange (2019), for example, states that YouTube hosts a large corpus of videos providing users with self-paced exploration, facilitating informal, highly restricted one-time engagements in which users learn how to perform a particular task. Such technology-assisted IL tools help users develop constructivist, experiential, and situated technical knowledge and skills (Sefton-Green, 2004).

Individuals' engagement in IL activities can be initiated by a variety of factors, some of which may be quite unexpected. The recent COVID-19 pandemic is one of these. The omnipresence of the unlimited learning can be most noticeable during such times of crisis. Not only did the pandemic disturb individuals' patterns of work, but it also caused them to rely (more) on alternative modes of learning. Ordinarily, IL often took center stage. Although the pandemic caused many hardships and vicissitudes, it also served as a 'disjuncture', a term defined by Jarvis (2009) as

> *"a situation in which we are not sure how to act, or even experience a 'magic moment' that just stops us in our tracks. It is something out of the normal - abnormal or supra-normal - and it gives rise to astonishment, wonder or some other emotion. (p. 15)"*

A disjuncture is a trigger for learning and therefore an important concept for LLL theory (Bjursell, 2020). Recently, much research has been conducted on the effects of the COVID-19 pandemic on school-age children's education and teachers' educational practices in response to the challenges posed by the pandemic (Deveci, 2022; Kuhfeld et al., 2020; Kumar, 2020; Tarkar, 2020). Similarly, the impacts of the pandemic on adults' learning in formal education settings have received some attention from researchers (Bjursell, 2020; James & Thériault, 2020). However, there is a dearth of research on adults' engagement in IL during the pandemic. It is crucial to ascertain the types of IL activities they engage in and how they perform these activities. Accordingly, this study seeks answers to the following questions.

1. What job-related intentional informal learning (IIL) activities do Turkey-based civil engineers engage in?

2. What general interest-related IIL activities do they engage in?

3. What learning methods/tools do they use?

2. Method

2.1. Participants

One-hundred ninety civil engineers, all members of the Chamber of Civil Engineers (CCE) Diyarbakir Branch in Turkey, participated in this study. Of this number, 161 were male and 29 were female. The participants' ages ranged from 23 to 59 and the mean age was 34. The majority of the participants (n=141) held an undergraduate degree, while 41 of them were MSE holders and eight were PhD holders. At the time of data collection, 156 were employed and 34 were unemployed.

2.2. Data collection and analysis

Data were collected using an online survey adapted from two separate sources: Livingstone (2006) and Lohman (2009). The survey items deemed relevant were translated into Turkish through a meticulous process. This involved reviewing the original items to ensure they were suitable for the Turkish context and specific research objectives. The chosen items were then translated from English to Turkish by the first author of the current paper and an independent professional translator, employing a back-translation method to ensure accuracy and consistency. Adjustments were made to ensure that the survey items were culturally relevant and comprehensible to the

members of the Diyarbakır branch, modifying certain terms, examples, or scenarios to better fit the Turkish culture and local context.

Before distributing the survey, official approval was obtained from CCE to ensure that the survey met ethical standards and was appropriate for the target audience. Following approval, the Turkish version of the survey was sent out to all members of the Diyarbakır branch via an online platform. Out of all the members, 195 completed the survey. However, upon reviewing the responses, five surveys were found to be incomplete and were thus excluded from the final dataset, ensuring that the data used for analysis was complete and reliable.

The adapted Turkish version of the survey was comprised of three sections. The first section collected data on demographics. In the second section, the respondents were first given a working definition of IIL: "all forms of intentional or tacit learning in which we engage either individually or collectively without direct reliance on a teacher or an externally organized curriculum" (Livingstone, 2006, p. 204). They were then asked to indicate the kind of IIL activities they engaged in related to their jobs and general interests since the start of the COVID-19 pandemic. They were also asked to indicate how often they engaged in these activities (1=Never, 5=Always). Following this, they were asked to indicate the methods they used for IIL (e.g., reading online pages, watching TV programs, reflecting on experiences) and how often they used them.

The content validity of the data collection instrument was established in two phases. First, to establish the representativeness of the items, expert opinion was sought from a professor of education with an extensive background in different domains of lifelong learning, including informal learning. The instrument, adjusted according to the feedback received, was piloted on ten engineers from different sub-disciplines. Their input helped ensure clarity of the items (Polit & Beck, 2006).

To assess the internal consistency of the adapted Turkish version of the survey, Cronbach's alpha was calculated for the items in the second section of the survey, which focused on respondents' engagement in IIL activities and the methods they used for IIL. Cronbach's Alpha for IIL Activity Frequency was calculated to be 0.89 while Cronbach's Alpha for IIL Methods Frequency was 0.85. These values indicate high internal consistency for both sets of items, suggesting that the items within each section reliably measure the same underlying construct of IIL engagement and methods.

Since the survey was self-administered, inter-rater reliability is not directly applicable. However, the consistency of coding open-ended responses was ensured by having two researchers code a random sample of 50 responses. The Cohen's kappa coefficient calculated to determine the level of agreement between the two coders was 0.82. This value indicates substantial agreement between the coders, ensuring the reliability of qualitative data coding.

These results indicate that the adapted Turkish version of the survey is a reliable and valid instrument for measuring IIL activities and methods among the respondents.

The data collected were analyzed using descriptive statistics. Descriptive statistics are used to summarize and describe the main features of a dataset. In this case, they were employed to detail the characteristics of the participants, such as age and gender. Additionally, descriptive statistics were used to calculate and report the averages related to the participants' IIL behaviors. This method provides a straightforward way to present basic information about the sample and the central tendencies of their responses, giving a clear picture of the demographic makeup and the typical IIL behaviors within the group.

3. Results

The first research question aimed at identifying the kind of job-related IIL activities the participants engaged in and how often they engaged in them. Table 1 summarizes the results.

Table 1.

Job-related IIL activities

	n=190	
	SD	$\bar{x}$
Technology	1.2	3.4
Communication	1.2	3.3
Problem-solving	1.2	3.2
Project-management	1.2	3.1
New task specifications	1.2	2.9
Labor rights	1.3	2.9
Occupational health and safety	1.3	2.8
Foreign language	1.2	2.4
Overall average	*1*	*3*

Table 1 shows that the frequency of the participants' overall engagement in job-related IIL activities was 3, pointing to an average amount of time spent on such learning activities. Albeit with an average frequency, the most frequent learning activity was about technology ($\bar{x}$=3.4), which was

followed by communication ($\bar{x}$=3.3), problem solving ($\bar{x}$=3.2), and project-management ($\bar{x}$=3.1). The participants also engaged in other job-related IIL activities, but with a comparatively lower frequency. These included management ($\bar{x}$=2.9), new task specifications ($\bar{x}$=2.9), labour rights ($\bar{x}$=2.9), occupational health and safety ($\bar{x}$=2.8), and foreign language ($\bar{x}$=2.4).

The analysis of the responses to the open-ended question in this section showed a few other job-related learning, including distance learning/teaching technologies. Another participant said the whole experience taught him what it means to be 'a modern slave'.

The second research question asked what general interest-related IIL activities the participants engaged in. Table 2 shows the results.

Table 2.

General interest-related IIL activities

	n=190	
	SD	$\bar{x}$
Information technologies	1.2	3.4
Science and technology	1.1	3.4
Personal development	1.1	3.3
Recreational activities	1.2	3.1
Public and political issues	1.3	2.9
Environmental issues	1.1	2.8
Religion and/or spirituality	1.3	2.6
Sports	1.1	2.6
Handicrafts	1.2	2.5
Pet care	1.2	1.8
Overall average	*0.8*	*2.8*

According to Table 2, the overall average for general interest-related IIL activities was 2.8, pointing to a relatively limited time spent. When the specific activities were considered, it appeared that IIL activities pertaining to information technologies ($\bar{x}$=3.4) and science and technology ($\bar{x}$=3.4) were more common. These were followed by activities related to personal development ($\bar{x}$=3.3) and recreation ($\bar{x}$= 3.1). Comparatively less time was spent for learning about public and political issues ($\bar{x}$=2.9) and environmental issues ($\bar{x}$=2.8). Similarly, the participants' engagement in learning activities about religion/spirituality ($\bar{x}$=2.6) and sports ($\bar{x}$=2.6) was rare. Neither did they spend much time on handicrafts ($\bar{x}$=2.5) or pet care ($\bar{x}$=1.8).

The analysis of the textual responses to the open-ended question in this section revealed no additional learning activities.

The third research question was related to the ways in which the participants engaged in IIL activities. Their responses are shown in Table 3.

Table 3.

Ways in which IIL was undertaken

	n=190	
	SD	$\bar{x}$
By reading educational texts on the Internet	1.2	3.5
By watching educational videos on the Internet	1.2	3.5
By reading books, magazines, and newspapers	1.1	3.1
By working with others	1.2	2.8
By watching educational TV programs	1.2	2.5
By listening to educational radio programs	1.2	2.2
By using the social media (e.g., Facebook, Twitter, Instagram)	1.2	1.2

Table 3 shows that the most frequent ways were reading educational texts and watching educational videos on the Internet, both of which received an average score of 3.5. This was followed by reading books, magazines and newspapers ($\bar{x}$=3.1). Only occasionally did the participants work with others ($\bar{x}$=2.8), watch educational TV programs ($\bar{x}$=2.5), and listen to educational radio programs ($\bar{x}$=2.2). They seldom used the social media ($\bar{x}$=1.2).

The analysis of the textual responses to the open-ended question related to the ways in which the participants engaged in IIL activity pointed to a few particular internet-based applications (i.e., YouTube and LinkedIn) that they used.

4. Discussion

This research identified the kind of IIL activities in which the Turkey-based civil engineers engaged since the beginning of the pandemic. It also investigated the ways in which they did this. The results revealed that the participants' overall engagement in job-related IIL was at a moderate level ($\bar{x}$=3). They also tended to engage in IIL job-related IIL activities more often than general interest-related IIL activities ($\bar{x}$=2.8). Taken as a whole, these data suggest that IIL was not generally a priority for the participants. However, when they initiated IIL, it was generally related to their jobs. This may be due to the pandemic requiring them to prioritize job-specific activities as a way of sustaining their livelihoods. Indeed, the COVID-19 pandemic did not deter companies around the globe from asking engineers to continue to work either from home or in the workplace (Persun, 2020). Faced with a new reality imposed by the pandemic, engineers in other parts of the world had

to adjust their work environments (Persun, 2020) requiring them to compensate for a lack of information and skills through IIL. Therefore, the pandemic can be said to have acted as a disjuncture creating learning opportunities (Bjursell, 2020; Jarvis, 2009), most of which were job-related.

Among the most common job-related IIL activities were those involving technology, which is in line with findings from previous studies indicating, "The trend towards the use of digital online reskilling has accelerated during the restrictions on in-person learning since the onset of the COVID-19 pandemic" (World Economic Forum, 2020, p. 38). Other IIL activities included communication, problem-solving, and project-management. It is possible that the participating engineers relied on technology to remedy the problems affecting their jobs. They might have had to learn about new applications, for example, to continue their projects, hold meetings with colleagues, and continue collaborative work. Hou (2020) observes that the pandemic has led to significant changes to the skills essential for civil engineers. This, he says, has caused them to rely on digital innovations, new ways of communicating with colleagues and working as teams. The participants' attention to technical skills along with soft skills (i.e., communication, problem- solving, and project-management) through IIL is important to note since these are among the top 10 skills of 2025 identified by the World Economic Forum (2020), noting 'The COVID-19 pandemic-induced lockdowns and related global recession of 2020 have created a highly uncertain outlook for the labour market and accelerated the arrival of the future of work" (p. 5).

It is also interesting to note that the top two general interest-related IIL activities in which the participants engaged were information technologies and science and technology. Considering the direct link between these and the technology skills under job-related IIL activities, the participants might have had more interest in the professional realm. Intrigued by this, we conducted an online search using the keywords 'engineers' and 'general interest'. We noticed that the latter is often linked to 'professional development', which includes general interest courses geared toward expansion of professional knowledge.

The results related to the ways in which the participants undertook IIL revealed that internet-based sources, including texts and educational videos, were the most common with an average rating of 3.5. This finding reiterates Lange's (2019) observation that educational videos such as YouTube provide instructional content allowing viewers to learn to perform specific tasks at their

own pace. In doing so, they gain access to experiential and situated learning opportunities (Sefton-Green, 2004).

Albeit less frequently, the participants also expressed an explicit interest in communicative and collaborative learning activities ($\bar{x}$=2.8). Given the possibility of IIL taking place collectively, we find this particularly important. Faced with a similar disjuncture, the participants likely experienced similar challenges to their job-related tasks. It is possible that this caused them to work collectively to learn how to tackle the issues at hand. Okita (2012) points out that interaction with others assists us in organizing our thoughts, reflecting on our understanding, and identifying holes in our reasoning. Related to this is Vygotsky's (1978) remark that our cognitive development is reinforced in sociocultural circumstances, where we engage with individuals who are more skilled than ourselves, whether a teacher or a peer. Collective IIL requires interpersonal communication skills, argued to be a key LLL skill (Deveci, 2019). Commission of the European Communities (2005) also underscores of interpersonal communication skills by saying that lifelong learners need to be able to "interact linguistically in an appropriate way in the full range of societal and cultural contexts — education and training, work, home, and leisure," and toward this end, they should acquire the skill of "communicat[ing] in oral and written forms in a variety of communicative situations and to monitor and adapt their own communication to the requirements of the situation," and "a positive attitude towards… interaction with others" (p. 13).

Since the pandemic often forbade them from meeting physically, they must have relied on technological tools such as Zoom and Skype. This likely produced IL opportunities for information technology and science and technology related learning engagement they mentioned in response to the first research question.

It is also interesting to note that social media sites like Facebook, Twitter and Instagram were unpopular venues for IIL. Considering the participants' overall more interest in job-related IIL activities than general-related IIL activities, this may not be a surprising finding. It is our observation too that these social media sites do not house job-related content specific to civil engineering. Another possible reason for the participants' limited tendency toward social media sites is that they perceived posts on social media as biased, limiting their trust in the kind of information/knowledge presented. Indeed, Menczer (2018) observes that a major source of news across the globe is social media exposing individuals to inaccurate content such as conspiracy theories, propaganda, and fake

news. Possibly affected by this as well, the participants of the current study were less likely to consult social media as a source of learning. Similarly, Lee and Sing (2013) also found that those who used social media for IL purposes often indicated that social media reduced their chances of achieving particular higher level learning outcomes, i.e., synthesis and evaluation.

5. Conclusion and recommendations

Some unexpected incidents like the COVID-19 pandemic can serve as a disjuncture (Bjursell, 2020) triggering various learning opportunities, some of which may be incidental and tacit while some may be intentional. Such learning can also occur formally and informally. The latter includes all learning activities related to work, family, or leisure (EU Council, 2012), and it can be tacit or intentional (Livingstone, 2006). Approaching the notion from the intentional perspective, the current study investigated Turkey-based 190 civil engineers' IL experiences triggered by the COVID-19 pandemic.

The results showed that the participants' engagement in IIL was at a moderate level, indicating IIL was not a priority for them. Yet, the results still indicate that the participating engineers resorted to IIL activities to compensate for the lack of information and skills they deemed important. It is important to note that these were normally job-related. Although they also general interest-related activities (e.g., information technologies, science and technology), they were still related to their work. Together, these data show that the participants were rather job-oriented in their IIL engagement. The results also showed that the participants generally utilized internet-based sources for IIL and preferred communicative and collaborative learning activities.

Anecdotal evidence shows that much of the in-service training and continuing education activities provided to civil engineers in Turkey are formally designed without adequate attention to informal aspects of learning. In fact, it appears that IIL is an alien concept to education providers. To reduce this problem, the curricula in trainer training programs should include the notion of LLL in general and IL/ILL in particular. In these programs, trainers should be equipped with skills to facilitate the participants' learning process and help them initiate learning experiences outside formal contexts. Participants' awareness must be raised concerning general interest-related activities beyond job-specific ones. In this way, they can be helped to achieve 'meaning in life', defined as "the extent to which people comprehend and see significance in their lives, as well as the

degree to which they perceive themselves to have a purpose or overarching aim in life" (Steger, 2009, p. 682), which may be of more prominence during times of crises such as the COVID-19 Pandemic. Previous research, in fact, found a positive correlation between adults' meaning in life and various aspects of their well-being including self-development (McMahan & Dehart-Renken, 2011).

Based on the results of the current study, it is also important for trainers to focus on the role of internet-based learning sources. There is now a variety of such resources including learning content and learning tools that can allow individuals to create the kind of learning environment most appropriate for their personal needs and preferences (Lebeničnik et al., 2015). Trainees should be guided on how best to exploit these in mindful ways in informal settings in addition to formal contexts. Undeniably, linking formal and informal learning in this way can encourage individuals to "reflect upon how learning is connected with other areas of personal, social, and working lives and manage and negotiate these relationships" (Facer & Sandford, 2010, p. 86).

Also, the participants' inclination for communicative learning activities should be borne in mind. Considering engineers' tendency to work in teams and in collaboration with professionals from other disciplines, this is of particular relevance. Therefore, guidance should be given to engineers about specific ways and tools they can use to engage in collaborative IIL activities, especially from distance. Researchers have produced customizable systems allowing this. One such example is by Arroyo et al. (2011), which facilitates learners' remote collaboration via a videoconferencing system simultaneously interacting through a shared multi-touch interactive surface. In this way, the system creates informal learning experiences in museum-like settings.

This study has some limitations. First, it only included civil engineers. Future studies can study other engineers too so that IIL learning experiences of engineers as a whole can be better understood. It is also important to note that the participants were from Turkey. A comparative study can be undertaken to understand how the IIL experiences of engineers in different contexts are affected by such disjunctures as the COVID-19 pandemic.

CONFLICT OF INTEREST STATEMENT

The authors declare that there is no conflict of interest in this study.

RESEARCH AND PUBLICATION ETHICS STATEMENT

The authors declare that research and publication ethics are followed in this study.

AUTHOR LIABILITY STATEMENT

The authors declared that they assumed equal responsibility at all stages of the research.

REFERENCES

Arroyo, E., Righi, V., Tarrago, R., Santos, P., Hernández-Leo, D., & Blat, J. (2011). Remote collaborative multi-user informal learning experiences: Design and evaluation. In: Kloos, C.D., Gillet, D., Crespo García, R.M., Wild, F., Wolpers, M. (eds) *Towards Ubiquitous Learning. EC-TEL 2011. Lecture Notes in Computer Science*, 6964. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-23985-4_5

Bjursell, C. (2020). "The COVID-19 Pandemic as Disjuncture: Lifelong Learning in a Context of Fear." *International Review of Education,* 66, 673-89. https://doi.org/10.1007/s11159-020-09863-w

Commission of the European Communities. (2005). *Proposal for a recommendation of the European Parliament and of the Councils on key competences for lifelong learning*. Brussels https://www.eumonitor.nl/9353000/1/j4nvgs5kjg27kof_j9vvik7m1c3gyxp/vkl58h3b78m1/f=/5464_18.pdf

Deveci, T. (2019). Interpersonal communication predispositions for lifelong learning: The case of first year students. *Journal of Education and Future*, *19*(15), 77-94. https://doi.org/10.30786/jef.358529

Deveci, T. (2022). UAE-based first-year university students' perception of lifelong learning skills affected by COVID-19. *Tuning in Higher Education, 9*(2), 279-306. https://doi.org/10.18543/tjhe.2069

EU Council (2012). *Official Journal of the European Union, Council Recommendation of 20th December 2012 on the validation of non-formal and informal learning* (2012/c 398/01)

Facer, K., & Sandford, R. (2010). The next 25 years? Future scenarios and future directions for education and technology. *Journal of Computer Assisted Learning, 26*(1), 74–93.

Fisher, R., Simmons, R., Thompson, T. (2019). Introduction to the lifelong learning sector. In J. Avis, R. Fisher and R. Thompson (Eds.). *Teaching in lifelong learning: A guide to theory and practice* (pp. 3-27). Open University Press.

Golding, B., Brown, M., & Foley, A. (2009). Informal learning: A discussion around defining and researching its breadth and importance. *Australian Journal of Adult Learning, 49*(1), 34–56

Havighurst, R. J. (1972). *Developmental tasks and education*. New York, NY: David McKay.

Hou, T. (09 September 2020). The impact of the 'new normal' on young engineers' careers. Institution of Civil Engineers. https://ice.org.uk/news-and-insight/ice-community-blog/september-2020/impact-of-the-new-normal-on-young-engineers, September 27, 2021

Huang, W. H. D., & Oh, E. (2016). Retaining disciplinary talents as informal learning outcomes in the digital age: An exploratory framework to engage undergraduate students with career decision-making processes. In V. C. X. Wang (Ed.), *Handbook of research on learning outcomes and opportunities in the digital age* (pp. 402–420). IGI Global.

Jarvis, P. (2009). Lifelong learning: A social ambiguity. In *The Routledge International Handbook of Lifelong Learning,* edited by P. Jarvis, 9-18. London and New York: Routledge.

James, N., & Thériault. V. (2020.) Adult education in times of the COVID-19 pandemic: Inequalities, changes, and resilience. *Studies in the Education of Adults, 52*(2), 129-133. https://doi.org/10.1080/02660830.2020.1811474

Keese, A. G. (2011). *A model for semi-informal online learning communities: A case study of the Nasa Inspire Project*. PhD Dissertation. Oklahoma State University.

Kuhfeld, M., Soland, J., Tarasawa, Bth., Johnson, A., Ruzek, E., & Liu, J. (2020). *Projecting the potential impacts of COVID-19 school closures on academic achievement.* (EdWorkingPaper: 20-226). Retrieved from Annenberg Institute at Brown University: https://doi.org/10.26300/cdrv-yw05

Kumar, P. J. (2020). Impact of pandemic COVID-19 on education in India. *International Journal of Current Research, 12*(7), 12583-12586.

Lai, H. J. (2017). Factors affecting knowledge acquisition among adult workers in online informal learning activities. *Eurasia Journal of Mathematics, Science and Technology Education, 14*(1), 505–515.

Lange, P. G. (2019). Informal learning on YouTube. In: Hobbs, R, Mihailidis, P (eds) *The International Encyclopedia of Media Literacy*. Hoboken, NJ: Wiley Online Library, pp. 1–11.

Lebeničnik, M., Pitt, I., & Starčič, A. I. (2015). Use of online learning resources in the development of learning environments at the intersection of formal and informal learning: The student as autonomous designer. *CEPS Journal, 5(*2), 95-113.

Lee, B., & Sing, S. A. (2013). Social media as an informal learning platform: Case study on adult learning at SIM University, Singapore. *Procedia- Social and Behavioral Sciences, 93*, 1158-1161.

Livingstone, D. (2006) Informal learning: conceptual distinctions and preliminary findings. In Z. Bekerman, N. C. Burbules, & D. SilbermanKeller, (Eds.). *Learning in places: The informal education reader* (pp. 203–228). New York: Peter Lang.

Lohman, M. C. (2009). A survey of the factors influencing the engagement of information technology professionals in informal learning activities. *Information Technology, Learning, and Performance Journal, 25*(1), 43-53.

McMahan, E. A., & Dehart Renken, M. (2011). Eudaimonic conceptions of well-being, meaning in life, and self-reported well-being: Initial test of a mediational model. *Personality and Individual Differences, 51,* 589-594.

Menczer, F. (2018, June 21). *Biases make people vulnerable to misinformation spread by social media.* Scientific American. https://www.scientificamerican.com/article/biases-make-people-vulnerable-to-misinformation-spread-by-social-media/

Okita, S. (2012). Social interaction and learning. In N. M. Seel (Ed.). *Encyclopedia of the sciences of learning* (pp. 3104-3107). New York, NY: Springer.

Persun, T. (Apr 9, 2020). How engineers are working through the Coronavirus pandemic. The American Society of Mechanical Engineers. https://www.asme.org/topics-resources/content/how-engineers-are-working-through-the-coronavirus-pandemic, December 27, 2021.

Polit, D. F., & Beck, C. T. (2006). The content validity index: Are you sure you know what's being reported? Critique and recommendations. *Research in Nursing and Health, 29*(5), 489-497. https://doi.org/10.1002/nur.20147

Pozgaj, A. (2008). Informal learning in lifelong education. *International Journal of Emerging Technologies in Learning, 3*, 50–53. Retrieved from https://online-journals.org/index.php/i-jet/article/view/612 on 14 February 2018

Scribne, S., & Cole, M. (1973). Cognitive consequences of formal and informal education. *Science, New Series, 182*(4112), 553–559.

Sefton-Green, J. (2004). *Literature review in informal learning with technology outside school*. Bristol, UK: Futurelab.

Steger, M. F. (2009). Meaning in life. In S. J. Lopez & C. R. Snyder. *The Oxford handbook of positive psychology* (2nd Edition) (pp. 679-687). New York: Oxford University Press.

Tarkar, P. (2020). Impact of Covid-19 pandemic on education system. *International Journal of Advanced Science and Technology, 29*(9), 3812-3814.

Thomas, A. (2002). Informal learning, home education and homeschooling. *The Encyclopedia of Informal Education*. Retrieved from https://infed.org/mobi/informal-learning-home-education-and-homeschooling-home-schooling/ on 14 February 2017.

Vygotsky, L. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.

World Economic Forum. (2020). *The future of jobs report 2020*. World Economic Forum: Geneva, Switzerland.

Yu, H., Liu, P., Huang, X., and Cao, Y. (2021) Teacher online informal learning as a means to innovative teaching during home quarantine in the COVID-19 pandemic. *Frontiers in Psychology, 12*, 596582. https://doi.org/10.3389/fpsyg.2021.59658