Students' experience with using social media for a sense of belonging in higher education during the COVID-19 pandemic

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Abstract

The COVID-19 pandemic significantly impacted society as a whole, and students were a particularly vulnerable group during this pandemic. Due to restrictions imposed by the pandemic such as social distancing and quarantine, students' sense of belonging was impacted. This paper aims to observe how students' usage of social media platforms helped create and nurture students' sense of belonging, as well as which features of social media platforms were particularly helpful. Findings suggest that platforms could benefit from implementing features that allow students to host and publish online and in-person events, as well as allowing a wider array of resource sharing on the platforms. This study was done as there is a significant lack of research on how students' belongingness was affected during the pandemic and the different ways they used social media to reduce the impact the pandemic had on their sense of belonging.

Research Ethics Approval

This project obtained approval from the Informatics Research Ethics Committee.
Ethics application number: 153386
Date when approval was obtained: 2023-11-09

The participants' information sheet and a consent form are included in the appendix.

Declaration

I declare that this thesis was composed by myself, that the work contained herein is my own except where explicitly stated otherwise in the text, and that this work has not been submitted for any other degree or professional qualification except as specified.

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Acknowledgements

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Chapter 1

Introduction

1.1 Motivation

Sense of belonging is defined as the experience of personal involvement in a system or environment [48] so that persons feel themselves to be an integral part of that system or environment. This has an important effect on society and the individual as it is a fundamental human motivation,[24] but especially for students. Students' emotional well-being and positive enhancing behavioural outcomes are linked to experiencing a sense of belonging in school [80].

The COVID-19 pandemic has been one of the biggest pandemics to affect the world, and humanity is still experiencing the aftershocks of it. As the virus transmission occurs with high efficacy mainly through the respiratory route, safeguards such as social distancing, city lockdowns, and face masks were introduced [19]. This made social interaction between people who didn't belong in the same household scarce. Therefore, people turned to online mediums such as social media to fill this need for interaction. This lack of social interaction and sense of belonging had a significant effect on students, with a lack of social belonging leading to increased levels of depression and anxiety [46]. In order to decrease this gap, students turned to social media to connect with other students and users [83].

Social media can be defined as internet-based channels that allow users to interact and selectively self-present opportunistically, either in real-time or asynchronously, with both broad and narrow audiences who derive value from user-generated content and the perception of interaction with others [33]. One of its main uses is to allow for the socialization of people through the Internet. Social media is one of the biggest uses of the Internet, with an estimated 4.9 billion people employing social media in 2023 [94]. This project analyses students' experience with using social media for a sense of belonging in higher education during the COVID-19 pandemic.

Some research has been done in this area, but not for these specific conditions. Gopalan, Linden-Carmichael, and Lanza [46] researched students' sense of belonging during the pandemic, but there is a lack of literature on how different features of social media have helped students form a sense of belonging during the pandemic. Chukwuere [36] investigated students' social interaction through social media but made no note

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of the ramifications of the pandemic. Kelly et al. [59] investigates the correlation between belonging and student retention in higher education and observes a relation between belonging, enjoyment, and motivation. This study focuses on Australian Higher education and does not observe how social media can bridge the gap that is created when social interaction is reduced, which is essential for students' sense of belonging [14]. This paper will focus on the lockdown period and the time that came after that, as not a lot of research has been focused on the exacerbated period when the pressure of lack of in-person social interaction drove more people towards social media.

Different social media platforms have different features that distinguish them from one another. Therefore, it would be useful to investigate and evaluate the impact of different social media platforms and their features on students' sense of belonging and design guidelines or recommendations that have been implemented after the pandemic and evaluate the effectiveness of these guidelines in fostering a sense of belonging between students. From there, we will observe which platforms are more suitable to help users develop a sense of belonging further or recommend features that platforms should have to help create a sense of belonging.

1.2   Aims and research questions

The aims of this project are as follows:

1. Explore what impact social media has had on students on their sense of belonging during and after the COVID-19 pandemic.

2. Review features of social media that were and how effective they were in fostering a sense of belonging for students during the pandemic.

3. Evaluate and compare a selection of social media based on features that promote a sense of belonging.

The research questions for this project are:

1. How has the pandemic affected the sense of belonging for students, and how has students' usage of social media helped bridge that gap?

    (a) According to the literature.

    (b) According to the University of Edinburgh.

2. What were students' preferred social media platforms for creating a sense of belonging during the COVID-19 pandemic?

    (a) According to the literature.

    (b) According to the University of Edinburgh.

3. What were the characteristics of social media platforms that were seen as desirable for students during the pandemic?

    (a) According to the literature.

    (b) According to the University of Edinburgh.

4. How do social media apps compare regarding their desirable characteristics (extracted from the literature) from RQ3a?

5. What design elements could be added to current social media platforms for them to enhance the student's sense of belonging in contexts similar to the pandemic?

This project looks to answer all of the research questions, therefore enabling researchers to obtain up-to-date guidelines on features of social media that foster a sense of belonging between students.

1.3 Summary of Project

Chapter 1 offers an overview of the project, motivation, aims and research questions. Chapter 2 contains the background information required for this project. Chapter 3 describes the methodology and the data collection methods employed in this project, whilst Chapter 4 details the systematic review carried out in this project. Chapter 5 offers a detailed record of the user studies performed in this project, and Chapter 6 contains the evaluation of the social media platforms. Finally, Chapter 7 deals with the discussion of the project, as well as conclusions and future expansion points.

Chapter 2

Background

2.1 Social Media

As stated before, social media is defined as internet-based channels that allow users to opportunistically interact and selectively self-present, either in real-time or asynchronously, with both broad and narrow audiences who derive value from user-generated content and the perception of interaction with others[33]. User-generated content is an essential part of social media, where individuals and groups can create user-specific profiles to use the platform[77]. An estimated 4.9 billion people used social media in 2023, with the average person using it for two hours and thirty-five minutes every day [94], and an estimated 90% of college students employ social networks [96]. However, social media is a widely used term which allows for a great number of platforms to fall under this definition. As such, we will adopt the convention that in this paper we will refer to social media platforms as platforms that allow more than two means of communication between users, as this will allow for the platforms to cater for different communication needs and preferences.

Social media has various functionalities, such as allowing users to create a personal or professional profile, sharing information and conversing with other users to name a few[33] [77].

Social media comes with its advantages and disadvantages for students, regardless of their age. There are benefits to social media, including the sharing of knowledge, building of relationships and development of communication skills. Akram [15] argues that it allows for extensive socialisation, sharing knowledge, feelings and thoughts, and enhances connectivity in society. Procentese, Gatti, and Napoli [84] suggest that family members can perceive new technologies as opportunities for increased family cohesion, interactions, planning, and open communications[92]. Furthermore, access to social media allows educators to teach good digital citizenship and the use of the Internet for productivity [96].

However, social media has negative aspects on students and users such as depression, excessive use of social media and cyberbullying [13]. Focusing on students, students' GPAs are more likely to decrease due to the amount of time spent on social media[50]. In a study that observed the impact of social media platforms on students' social

interaction, 89.5% of the participants, who were higher education students, had the view that social media promotes physical distance from friends, as when friends gather, they spend time engaging on social media rather than interacting with the people around them[36]. One of the main disadvantages of social media is the ability to cyberbully users with relatively high anonymity. Throughout 2021, the Cyberbullying Research Centre reported that 23.2% of students aged 13-17 were bullied. This can have negative effects on the victim, such as anxiety, loneliness, sadness, over-compliance, and insecurity [26].

2.2 Sense of Belonging

Belonging is a basic human need which is conceptualized as the feeling of social connectedness or a sense of positive association with others. Therefore, we define a sense of belonging as the experience of personal involvement in a system or environment so that persons feel themselves to be an integral part of that system or environment [48][89]. Belonging is a fundamental psychological necessity, being recognised as one in Maslow's hierarchy of needs. Placed after essential safety and psychological requirements, but before experiencing esteem and desire for self-actualization, it is an essential need for human beings [65]. A sense of belonging is associated with well-being and is an interpersonal process that influences health [47] [89]. Feeling this connectedness is vital to human life and development as through interpersonal relationships, humans grow, develop and survive [47].

Several studies have researched the impact of social support on health, with support providing nourishment to self-esteem, normative affirmation, and dependency relatedness amongst other benefits [58]. As stated by Cohen [38], social support refers to a social network's provision of psychological and material resources intended to benefit an individual's ability to cope with stress. Social support is one of the three resources that social support provides is emotional support, which involves the expression of empathy, caring, reassurance, and trust and provides opportunities for emotional expression and venting. This ability to feel supported contributes to a positive association with others, which aligns with our definition of belonging.

A sense of belonging is a vital part of higher education for students. There is a strong correlation between student retention and persistence and their sense of belonging [100]. The ability to feel a sense of belonging is related to positive mental health when the person can receive help from the community they are integrated into, and contribute to the community in return. The stronger the self-perceived sense of belonging to a community, the greater the likelihood of success for the student [100]. Several studies have also researched the lack of a sense of belonging in students. When students possess belonging uncertainty, that is, they are more uncertain of the quality of their belonging, they are more uncertain and sensitive to matters of social belonging. Events that threaten a person's social connectedness can cause repercussions on students, such as large effects on motivation, especially among socially stigmatised individuals [112].

Braddock, Heide, and Spaniardi [28] found that social media can increase the sense of belonging in teens as it provides a new channel for them to connect, as well as allowing

them to seek social support and discover new ideas and perspectives. It can also be used as an educational tool, with social media platforms allowing students to exchange information and ideas about assignments, and allowing them to collaborate outside of a school setting.

2.3 Impact of COVID-19 pandemic on sense of belonging in higher education

The COVID-19 pandemic was caused by the global spread of SARS-CoV-2 (Severe acute respiratory syndrome coronavirus 2 [37]) and the thousands of deaths caused by coronavirus disease (COVID-19) led the World Health Organization to declare a pandemic on 12 March 2020 [37]. As SARS-CoV 2 is a respiratory virus, transmission occurs with high efficacy mainly through the respiratory route [37]. Therefore, to reduce contagion, preventive measures such as social distancing and lockdown, as indicated by the WHO, were implemented worldwide. Regarding education, this implied the movement of learning to e-learning and the introduction of social distancing [86].

This leads to some limitations to the overall experience of students, as the camaraderie and sense of belonging are limited in a virtual class environment [86]. Kelly et al. [59] reinforces the view that there is a relationship between student retention in higher education and a sense of belonging, an argument that had been made before by Gillen-O'Neel [44], who stated that sense of belonging was associated with all types of student engagement at both the person and the daily levels. Additionally, the lack of social interactions and communication has led to students missing opportunities to develop meaningful relationships with their peers and professors, leading to a lower sense of belonging [73]. A well-connected environment that helps students develop their sense of belonging aids students in their learning, as Morán-Soto et al. [73] found that there is a correlation between students' learning and their sense of belonging. On the opposite end, Barringer, Papp, and Gu [22] found that there was no significant direct change in college students' reported levels of belonging during the pandemic as compared to before the pandemic, however, they acknowledged that this could be due to the socio-political situation that students experienced directly before the pandemic.

2.4 Design Guidelines

As this project will look into the design features of social media, we must define what design guidelines and design principles are. The desirable user interface is intuitive and easy to use, amongst other characteristics, however, these characteristics are difficult to quantify, therefore, guidelines exist to help designers achieve these desired characteristics [27]. Design principles, as we conceive them, consist of clear rules of thumb that have defined features [27]. These are utilised to ensure that users can employ interfaces without confusion and considerable effort.

2.5   Methods of data collection

2.5.1   User Studies

User studies are the methodic study of target users—including their needs and main use points [114][43]. It is an area that looks into information use and needs, and information-seeking behavior [95]. Due to performing some user studies in this project, some research was carried out to find different types of user studies and their advantages and disadvantages.

A *questionnaire* is a research instrument consisting of a series of questions to gather information from respondents [67]. As stated by Stone [102], a questionnaire must be appropriate, that is, it is capable of collecting answers to the asked questions, and the questions in the questionnaire must be intelligible, unambiguous, unbiased and omnicompetent.

Questionnaires are a way to quickly obtain data efficiently as they can reach a wide variety of participants and are cheap and easy to create and analyse. However, there is a possibility of a low number of participants and there is the possibility that participants will see past the wording of a question to what they presume the researcher's intent is, and what they surmise that the researcher wants them to answer [61]. There is also the possibility that respondents leave questions unanswered for want of speed in finishing the questionnaire. Furthermore, it is possible that the participant pool is not representative of the population due to the reach of the questionnaire or the way that it is distributed.

An *interview* is an extendable conversation between people that aims to obtain in-depth information about a certain topic or subject [21]. Interviews tend to be one-on-one, with an interviewer and an interviewee. There are four types of interviews, structured, unstructured, semi-structured and focus groups [17].

A structured interview follows a rigid procedure and set of questions, an unstructured interview does not have a prearranged set of questions, a semi-structured interview has a prearranged set of questions but can deviate from it, and a focus group is an interview in which a group of participants are interviewed together and communication between participants is encouraged.

Interviews provide a rich quantity of data, as well as the possibility of reducing the rate of incomplete answers from the interviewees. Furthermore, it is a relatively flexible study, so the interviewee can incorporate their own experiences and views into the answers. However, it is very time-consuming as it tends to be one-on-one, and therefore they tend to be quite limited, leading to the possibility of bias being present in the data [17] [79].

A *focus group* is a type of interview that consists of an informal discussion among selected individuals about specific topics [25]. Participants tend to focus on a specific topic selected by the researcher, and they tend to be a group selected specifically by the researcher [113].

Focus groups allow the researcher to obtain a wide variety of interactive data, that

is, as it comes from the interaction of the participants in the group [113]. Focus groups have the possibility of allowing the researcher to observe how the views of participants are expressed, defended and sometimes modified when in discussion with other participants, and they are often cheap and easy to run [101][82]. However, there is a very strong possibility of the data being biased due to the small number of participants and the fact that they are specifically selected [113] [82]. Furthermore, they can be very time-consuming and require skilful moderation from the interviewer.

2.5.2 Systematic review and PRISMA Statement

A systematic review extensively scans all reports published on the subject to find the answers to a clearly defined research question, and to that end will use various inclusion and exclusion criteria to identify the reports to be included in the review, and then synthesize the findings [93]. Whilst a literature review focuses on a wider approach to the literature surrounding a topic, a systematic review focuses on a specific and focused research question [103]. The Preferred Reporting Items for Systematic reviews and Meta-Analysis statement, or PRISMA statement, is a method of performing a systematic review which allows for systematic reviewers to report why the review was done, what the authors did, and what they found transparently [81]. This report will be utilising the PRISMA 2020 statement.

To perform a systematic review, the reviewer must take the steps set by the PRISMA statement [81]. Firstly, the reviewer must state which objectives or questions the review addresses, and describe the rationale for employing a systematic review, which falls under the Introduction section for the statement. Then, the methods for the review must be set. These are the methods that the researcher will be employing through the review. The first step is deciding the eligibility criteria, which are the requirements that papers or articles must satisfy to be reviewed. Alongside this, the information sources and search strategy must be specified. An information source is a source from which information is extracted, be it a paper, article or book. A search strategy is a strategy outlining steps and requirements the researcher employs to find the relevant papers for their studies. A record of the steps taken in the selection process must be kept. The next steps fall under the Results section. The selection process specifies the methods used to decide whether a study met the inclusion criteria of the review. After the search has been completed and the papers selected, the relevant information must be extracted from the selected papers, and presented.

2.6 Methods on data analysis

2.6.1 Quantitative Data Analysis

In the quantitative research design, the principal purpose is to regulate the connotation between an independent variable and a dependent or consequence variable in a population [69]. Therefore, it is useful to understand main trends and numerical data. This type of analysis will be employed to analyse the trends in the questionnaire, and are called descriptive statistics. They are employed to estimate characteristics, often called

variables, of a population. This includes calculating the mean, median and standard deviation [76]. The mean is the average value of a data sample, the median is the value separating the higher half from the lower half of a data sample and the standard deviation is a measure of the amount of variation that a random variable can have about its mean [91].

2.6.2 Qualitative Data Analysis

Qualitative data is data that can be collected and analyzed in a non-numerical form, as it can consist of audio files, text or visual data [69].

We will be employing thematic analysis to analyse the data. This consists of finding, analysing and reporting patterns, also referred to as themes, in the answers. A theme captures something important about the data concerning the research question and represents some level of patterned response or meaning within the data set [29]. Furthermore, the 'keyness' of a theme is whether it captures something important concerning the overall research question. They should be an accurate reflection of the content of the entire data set [29]. We utilised NVivo to apply thematic analysis to the questionnaire's open responses. NVivo is a tool which allows researchers to classify and identify themes within the data.

Thematic analysis can be carried out in two ways; bottom-up, or top-down. A bottom-up approach is the process of coding the data without trying to fit it into a pre-existing coding frame, making it a data-driven approach, whilst a top-down approach tends to be driven by the researcher's analytic interest in the data, which tends to provide a less detailed description but a more detailed analysis [29].

2.7 Related works

Whilst this specific area has not been researched in detail, some similar projects have been carried out. To keep in line with the timeline of the pandemic, most of the papers observed for related works have been published from 2020 onwards. Papers that have been observed from before this period relate sense of belonging in higher education to social media.

Chukwuere [36] uses quantitative methods to observe and analyse the impact that social media has on students' interactions. It observes that the main function of social media is for social interaction. It does not look into the impact of COVID-19 on social interaction, which is an oversight as restrictions due to the pandemic were still active.

Students' belongingness through the pandemic was observed by some studies, with these studies spanning different countries and taking into account different age groups of students. One study observed that there was not a significant change in students' sense of belonging when comparing their sense of belonging from before the pandemic to after the pandemic [22]. It was instead observed that characteristics that affected students' sense of belonging could be classified by race-ethnicity. This same study considered that this could also be due to socio-political movements that were occurring over that period. On the other hand, Mooney and Becker [72] found that, when observing Computer

Science students' sense of belonging, the pandemic had had a greater impact over a few months than their observations from a few years prior. However, students who identified as a minority experienced sharp drops in their belongingness, which leads to the conclusion that many factors influence a sense of belonging.

Looking at this area from a different perspective, Tice et al. [107] proposed different ways in which professors could help with student belongingness by providing different approaches to interacting with students. As many students develop various kinds of pseudo-relationships with their instructors and look to their instructors for social support, it is also essential that instructors are up to date on different ways in which they can support students, both online and offline [107].

Social media was also observed as an avenue to deepen and enhance social connections between students. Vincent [110] observed how it can affect students' sense of belonging, but it focused on how counsellors can adapt social media into their counselling sessions. It also shines a light on the negative aspects of social media, which can impact students such as the possible lack of privacy, possible safety concerns and the inability to control other users' reactions within social media. Another paper observed that students seeking to connect with their peers online often experienced stress, anxiety, negative self-worth, and guilt when viewing or creating social media content [99]. As social media is a significant part of society, especially within students' lives, and it is constantly evolving and improving, counsellors and teachers alike must stay up to date on different ways in which they can help students best utilize these tools, as overlooking these platforms could be a grave error.

Tice et al. [107] also looks at students' belongingness in higher education during the COVID-19 pandemic, with a focus on Australian higher education, and focuses on the sense of belonging dropping drastically after lockdown. One of the main findings was that whilst social closeness was available due to social media, physical closeness was not the same. However, it focuses on how lecturers and professors can help increase students' sense of belonging during e-learning periods, rather than reflecting on students' experiences. Whilst it is an interesting perspective, it focuses on pedagogical approaches to e-learning that help foster a sense of belonging, rather than students' experience with social media to gain that sense of belonging.

A main consensus in the literature was that students were a particularly vulnerable group, and as a whole, they had been severely impacted by the pandemic [54]. Thus, several papers recommended that professors and counsellors provide more resources and ways for students to connect between themselves, and within their university or respective associations. Jaremka, Kane, and Bell [54] suggested that students utilize social media to create a network of student mentors and mentees as this increases prosocial behaviour between students.

When investigating the different features of social media, papers that contain technical information about social media such as design guidelines or features, do not give a formal explanation about why those guidelines were chosen, or the papers were outdated, which is a problem as social media is constantly evolving and being updated. This further motivated this project, as it would be helpful for future designers to take these guidelines into account when further improving social media.

Chapter 3

Methodology

This chapter contains an overview of the methodology carried out in this project.

1. **Literature review of sense of belonging in higher education and use of social media:** The first step of this project was to carry out a literature review to observe and analyse the research that has already been published on the different areas this project focuses on. This step aimed to identify what has been researched, and what gaps this project could fill, as well as determine if a more thorough review would be needed. Therefore, reading was conducted on the term sense of belonging in higher education, social media in higher education and the COVID-19 pandemic, as well as sense of belonging with social media in higher education during the COVID-19 pandemic to observe if any papers that research the topic that this paper looks into. This step was carried out to aid with the scope of A1 and A2, and to answer RQ1a, and RQ2a.

2. **Identification of features of social media:** Since there is not a lot of literature available on the features of social media, as social media is a well-known term and many of its features are considered such an essential component of social media that users take them for granted, a systematic review was carried out to find the desirable features of social media that were useful to students to create a sense of belonging during to the COVID-19 pandemic. This was done to obtain a comprehensive guideline of shared and distinct features of different platforms of social media and to evaluate and discern which ones are most beneficial and harmful in enhancing students' sense of belonging in higher education. The systematic review was carried out following the PRISMA statement guidelines, as it is a popular and thorough way to carry out systematic reviews. A mixture of bottom-up and top-down analysis will be employed to provide a richer analysis. Additionally, we will be analysing the themes at a semantic level, that is, we will not be looking beyond what the participant has written, nor will there be an attempt to identify underlying ideas or assumptions. This step was carried out to aid with the scope of A1 and A2, and to answer RQ1a, RQ2a, and RQ3a.

3. **Questionnaire on social media usage and sense of belonging:** A simple questionnaire was distributed among the students of the University of Edinburgh. The purpose of this questionnaire was to gain some insight into the university's

students' use of social media through the pandemic and to obtain a view as to how the students generally feel about using social media to create a sense of belonging through the pandemic.

Whilst the systematic review, will aid in obtaining formal information and definitions of features of social media, by employing an user study we are able to obtain specific instances of students' experience with social media for a sense of belonging in higher education. It will allow students to share their experiences and opinions directly, and we can obtain information as to how students were affected personally by the pandemic, and how they utilised social media to connect with other users. Additionally, there is the possibility that experiences obtained from the systematic review reported by teachers or researchers which were observations of their students, and not necessarily directly from students. The user study bridges this gap by ensuring we are obtaining these experiences directly from students.

A questionnaire was chosen as it is a simple way to obtain views about social media from a variety of students. Concerns about focus groups and interviews recruiting a small number of participants, and therefore being too small to provide unbiased data were raised, as we are looking to obtain a wide variety of experiences using social media. Interviews also take a considerable amount of time to gather information. Since our main demographic is students in higher education, there is the possibility that they are not willing to commit the time to be interviewed. Focus groups would provide a bigger variety of data, however, there is a considerable logistical element to it, as all of the participants and researchers must agree to a scheduled interview, and the researcher must also be a moderator throughout the session. Furthermore, ease of distribution and lower time commitment were also considered beneficial points to the study, and thus, a questionnaire was chosen as the main user study for this project.

A mixture of bottom-up and top-down analysis will be employed to provide a richer analysis. This step was carried out to aid with the scope of A1 and A2, and to answer RQ1b, RQ2b, and RQ3b.

4. **Evaluation and creation of guidelines:** Based on the information obtained from the questionnaire and the systematic review, the most desirable features a social media platform can have to bolster students' sense of belonging will be identified and collected. From there, a simple evaluation was carried out to see which platforms implement these features best, and therefore refine what features are considered beneficial so that they are a guiding point for future designers and students. As there the opinions of the participants of the questionnaire do not represent the views of students worldwide, we will be evaluating the features of social media that were obtained from the systematic review. The five most utilised social media platforms from the questionnaire and the systematic review were selected, as we evaluated how the most popular platforms are measured against each other. This step was carried out to aid with the scope of A2 and A3, and to answer RQ4, and RQ5.

Chapter 4

Systematic Review

As stated in the background chapter, to conduct a systematic review, the methodology must be planned before conducting the systematic review. The systematic review was conducted under the PRISMA guidelines, as it is a popular way to conduct a systematic review. Therefore, we outline the steps needed to be taken following the PRISMA statement.

4.1 Aims and Objectives

The main aims of this systematic review are to obtain information about what features students consider desirable within the literature (RQ3a), how social media platforms compare in regards to their desirable features (RQ4) and the main social media platforms used by students (RQ2a), as we partially addressing the groundwork needed towards the hands-on evaluation to obtain an answer for RQ4.

4.2 Eligibility Criteria

Within this section, we are identifying criteria that the search results should respect to be considered in this systematic review. We enumerate them as follows:

- E1: The source must be in English.

- E2: The time constraint should be 2020-2023, as the articles must be recent to be accurate, therefore, we are including the last three years. Additionally, this includes the COVID-19 pandemic from start to finish.

- E3: Must be reliable. This means that the paper was published somewhere that was reviewed or peer-reviewed. Personal web pages and blogs do not count. Must be published by an institution. Published articles, journals, conference papers and books are some examples of what is acceptable.

- E4: Resource should be accessed freely, either by it being free or if it falls under the University of Edinburgh license.

- E5: Resource must refer to the COVID-19 pandemic.

- E6: Social media mentioned in the resource must be active.

- E7: Social media mentioned in the resource must meet our definition of social media presented in this paper.

- E8: Must mention social media usage or experience for students in higher education.

- E9: Must make mention of feature guidelines or synonyms such as feature recommendations and design guidelines.

- E10: Must mention COVID-19 as an impact or as an influence on the guidelines.

- E11: Must mention how the guidelines affect or enhance students' experience with social media

If a paper fails at least one of the eligibility criteria, it is to be discarded.

4.3   Information sources

We employed Google Scholar [12] as an information source to look for papers as we are looking for formal features of social media. It is a search engine for published academic work, which will help with EC3.

4.4   Search Strategy

To know how to search for the relevant papers, we outline a search strategy that filters out papers that do not satisfy any of the EC. The search strategy is outlined as follows:

- Set Language to English

- Set time published to 2020-2023.

- Enter the designated keywords. To ensure the inclusion of keywords in papers, use "" and AND, as this will ensure all of the words. "social media" + ("design recommendations" OR "design guidelines" OR "feature guidelines" OR "feature recommendations") + "COVID-19" + "higher education".

The term social media was included as it is the main focus of the investigation and thus must be included in the paper. As we are researching during the COVID-19 pandemic, the date that the papers must be published during 2020-2023, as this is when the papers that were influenced by the pandemic were published. Additionally, COVID-19 was a keyword to ensure that the papers published had some relation to the pandemic. The variations of design guidelines are to make sure the papers include guidelines about social media, but we want to cover all probabilities of how they mention the guidelines. Finally, higher education ensures that it is centred around higher education as that is where we are investigating the sense of belonging, so we would like to see how it is affected, and how the implementation of these guidelines will have an impact on it.

The term design guidelines was preferred over features as it can include more general aspects of features, however, feature recommendations was also included to not overlook

any papers that contained information about features. As design guidelines are sets of recommendations on how to apply design principles to provide a positive user experience, they encompass the principle of features[1], therefore it is more inclusive to include this term. Scroll to the bottom to select showing omitted results, and after patents and citations were deselected, scroll back to the bottom to make a note of the number of entries.

4.5 Selection Process

The selection process is how the papers will be checked if they fulfil all of the eligibility criteria. If any of the resources fail any of the steps in the selection process they will be discarded.

1. Check the publication date from the search result per EC2.

2. The paper must be in English per EC1.

3. Click the link to access the paper. Check the publisher of the paper per EC3.

4. Paper must be accessible per EC4.

5. Reading the title and abstract to ensure that social media, higher education and COVID are included, but synonyms will be accepted. The abstract should talk about the usage of social media during COVID-19 in the context of higher education per EC5 and EC8.

6. Control f to check social media and read the paragraph around, extract names and check if they are in use and if they conform to the definition of social media by opening a separate page as per E6 and E7.

7. If all of the social media mentioned in the resource do not conform to our definition of social media or the social media platform is no longer in use, the resource must be discarded. If at least one of the social media mentioned in the resource conforms to the definition and is still in use, it will be considered for the review, but all parts that mention other non-eligible social media platforms will not be considered. This is in line with EC6 and EC7.

8. The papers must be relevant to the topic, so they must contain guidelines/recommendations about social media at any point in the paper. Control F to find the keyword and analyse the surrounding paragraph. Answers EC9.

9. Must mention COVID-19 as an impact or as an influence on the guidelines. Control F to find COVID-19. EC10.

10. Must also make mention of higher education in the paper as to how the guidelines affect or enhance students' experience with social media. Control F to find the keyword and analyse the surrounding paragraph. EC11.

4.6   Data Collection

After performing the search following the Search Strategy outlined, a selection of data was extracted from these resources. As the main aim of the systematic review was to obtain tools, as well as desirable features of social media, Control F was used to find the keywords "social media", "feature", "design guideline" and "design recommendation", and the paragraphs surrounding them were read to extract the relevant information. The relevant information was then extracted into a table and thematic analysis was performed on them [29]. Additionally, the results section of the publication and any subsequent sections were read to see if any data items could be extracted from them. If there was no Results section, the paper was browsed and it was decided which other section title could contain saught information, and it was read in its entirety.

4.7   Data Items

The data items obtained in this project are related to social media, features that social media platforms contain and their connotation. For each resource, the following data items will be extracted

- Name of the resource.

- Author

- Date of resource

- Type of resource (article/book/dissertation/thesis/report/etc): Whether the resource is an article, paper or book.

- Social Media (name/"General"): If the paper refers to a specific social media platform, it will be noted, otherwise, social media will be put as a generality.

- Feature (name of this feature as it appears for that platform): If the resource refers to a specific feature of social media, it will be noted.

- Guideline (quote): If the resource refers to a specific guideline of social media, it will be noted.

- Positive Experience (quote): If the user has had a positive experience with the feature/guideline it will be noted in this section.

- Negative Experience (quote): If the user has had a negative experience with the feature/guideline it will be noted in this section.

- Neutral Experience (quote): If the user has had a neutral experience with the feature/guideline it will be noted in this section

4.8   Data Synthesis

I will be obtaining features directly from the data items: feature and guideline. Thematic analysis will be carried out on the following data items, positive experience and negative

experience, to extract features of social media and whether they are considered beneficial or harmful. Bottom-up synthesis will be carried out as themes will be extracted from the data [29]. Statistical analysis will also be carried out on the data item social media to extract the most and least popular social media platforms according to the literature [76].

A mixture of top-down analysis will be carried out with the thematic analysis. Two starter themes were devised at the beginning, Features of Social Media and Usage of Social Media. From there, bottom-up analysis was carried out, and as the analysis was being carried out, new themes and sub-themes would be added to refine these starter themes.

4.9 Results

4.9.1 Selection of Studies

A total of 924 records were identified after a first sweep and were screened to see if they satisfied the eligibility criteria. All 924 articles were assessed for eligibility, but only 24 were employed in the study as they satisfied the eligibility criteria. A table of the 24 papers is included in Appendix I.

The reason for the difference in identified resources and utilised resources can be attributed to the fact that as social media was one of the keywords in the search, any paper that contained social media as well as all the other keyboards appeared. However, many papers simply mentioned social media as a way to either share their project or a way to distribute their user studies. This did not provide any additional information on the features of social media, therefore, these resources were discarded.

From these, 198 data points were extracted. As stated in the PRISMA planning [81], each data point had the name, author, type and date of publication as well as social media extracted, and depending on the particular item, either a feature, a guideline or an experience would be extracted. As we already had the main themes, every new sub-theme that appeared was coded under its relevant main theme. A complete hierarchy of the themes can be found in Appendix E, and a link to the page of data points is included in Appendix I.

4.9.2 Results of Synthesis

4.9.2.1 Features of Social Media

For Features of Social Media, each sub-theme was a specific feature obtained from literature, and they were each further divided into three sub-subthemes; positive, which indicated a positive experience with said feature, negative, which indicated a negative experience with said feature, and neutral, which either indicated a neutral experience of the feature or a mention of the feature in a neutral environment.

Ability to Message: Eight papers stated that giving users the ability to message other users helped users communicate between them, which helps create positive interactions.

[30] [106] [55] [64] [39] [74] [90] [57] The ability to send both private and public messages, being able to send multimedia messages, the possibility of using comment features and emojis, and a specific messaging platform, as well as the sharing of resources, were seen as beneficial by papers.

Accessibility: Accessibility was recognised by four papers to be a useful feature, [111] [106] [39] [74] with different papers recognising that platforms that have a design that is meant to be usable by people with disabilities are considered beneficial inclusive and accessible by users.

Aesthetic: The visual component of social media platforms referred to as the aesthetic of the platform, is a feature that has been commented on by four papers [111] [106] [34] [60]. Platforms that were perceived as having a clean format and presentation, and were visually appealing had a better opinion from students. Teyssandier [106] stated that when speaking about Facebook [4] and Twitter [11], "*Providing content in a clean and usable format is the priority for this approach.*"

Alerts: Alerts, which are defined as the ability of social media platforms to send notifications to the users, are considered overall a negative feature, as they are a constant incentive for the user to look and utilise social media, with one study commenting on the negative impact this had on students.[40] Demir and Birgili [40] noted this, saying that "*...reading on screens is tied to multitasking activities and potential distractions (...), such as checking e-mail or social media notifications.*"

Availability: One study also observed that the wide availability of social media, which allows users to access social media whenever they wish, was a feature much appreciated by students [111].

Community: An important feature of social media is community, which is encouraged by the fact that social media allows users to add contacts and have followers [111] [30] [106] [55] [74] [105] [88]. Users can then create networks and different groups as it suits their needs, a feature that researchers observed was appreciated by students, as they made use of this to create groups for different courses, and to communicate within higher education settings, and outside of them. Teyssandier [106] observed that "*...use of social media would also create an easy way for learners to share both resources and their projects across different formats in a way that would be visible to others, to get to know each other and help learners build social bonds...*" The ability to moderate these servers also had a high value, as it prevents unwanted resources or media from being shared through the servers, and it also helped regulate and reduce instances such as cyberbullying, which was found to be prevalent in primary education settings. This sub-feature, along with the possibility of making these groups private, is highly valuable to students.

Cost: Social media is made available at no cost, a feature that greatly incentivizes students to utilise social media, with two papers remarking that freely available social media made students more open to using them as it did not require a cost to set up an account in social media [111][74]. However, they stated that whilst some social media offer premium characteristics at a cost, this was noted to have no impact on students, as the buying of premiums was optional.

Events: Two papers reported that students made use of the fact that they can host events within social media platforms to connect with other students [106] [88]. It was also noted that students can utilise social media to organise in-person events, making it a useful feature. Rioga et al. [88] said that "*The most common social media sources were Facebook and Instagram for everyday information practices, along with the university and student groups, such as events happening on or near campus*"

Multi-platform compatibility: Social media platforms offer the possibility to be accessed on various platforms and devices,[111] [106] [55] [39] [74] [90] making it a useful feature for students who can access their accounts from different devices such as their laptops or mobile phones, although Mullen and Murray [74] makes note of the fact that students use their smartphones almost exclusively to connect to their social media platforms. Students also valued security features, which allowed them to have a secure login independently of where they accessed the platforms. One study remarked that the privacy options offered by social media also had a positive influence on students, and allowing them control of their privacy is considered overall a positive feature [23].

Profiles: To utilise social media, any user has to create a profile. The representation of the profile is different in social media, with some platforms like YouTube [2] or Twitch [3] creating a channel, or Facebook [4] creating a page. This profile can be as the user desires, with it being anonymous, or uniquely personal to each user. This was appreciated by students as they could have separate profiles for their personal and professional lives [106] [55] [74] [31]. Users can also follow different users on the same platform, making it useful to create a network of known people. Profiles help users trust other users and increase their confidence between users, as Buest [30] put it when investigating the usage of social media in collaboration in higher education, "*Facebook (...) helped elevate the confidence between the researcher and the respondent, since both needed to display their personal information*"

Post Features: Users can also utilise different post features to communicate with other users. Twelve studies found many features under this subgroup such as the ability to follow users, the ability to like posts, the ability to download posts, ease of posting different posts. Users also can engage with posts and classify them utilising hashtags, and they should be able to post different kinds of content [111] [30] [53] [106] [55] [66] [64] [74] [90] [57] [42] [40]. Posts should have the ability to be shared, sent and commented on. Teyssandier [106] found that having the ability to comment on posts helped build a feeling of community, "*(...) participants show mentoring behaviours through comments, providing feedback and guidance to other writers using the comment features of these online communities*".

Types of Posts: The feature that allows students to post different kinds of media on social media is considered extremely useful for all users, but especially for students as they can send different messages with different content, making it highly useful when discussing matters related to university dealings [30] [106] [55] [66] [64] [74] [40] [42]. A student interviewed for "Effective Use Of Social Media Networks For Collaborative Learning In Higher Education" [55] stated that " *So, the way social media is used in those sorts of assignments is vastly different. There is a higher level of discussion and development and sharing with images and video and a lot more visual content parts between the message platforms.*" The different types of posts observed in studies were

audio posts, digital flyers, games, GIFs, images, link pages, live streaming, memes, polls, texts, threads, tweets and videos. It is worth mentioning that some of these posts are unique to specific social media platforms, for example, tweets are unique to Twitter [11].

Usability: Nine studies also found that students benefited from the different usability features that social media platforms offered [111] [34] [106] [39] [74] [90] [23] [97] [88]. Students take advantage of the fact that social media is convenient, and allows them to have a seamless interaction when employing it. [34] This, paired with the fact that social media has minimal barriers for posting and joining, along with its ease of use, the flexibility it offers and its user-friendly interface with which many students are familiar, encourages students to utilise it for many different uses, which will be explored in the following section.

4.9.2.2 Usage of Social Media

For Usage of Social Media, each sub-theme was an umbrella theme as to how different users utilise social media. The usages of social media were as follows: the building of communities and the ability to moderate these communities, collaboration between users, communication between users including advertising, dangerous use of social media, educating themselves or other users, engaging with other users, hosting of events in which users can partake in, post different posts and contents, share and present an image of themselves to other users, share content through social media and track and monitor other users through social media. [111] [34] [106] [39] [74] [90] [23] [97] [88] [55] [66] [42] [40] [64] [30] [53] [31]

The most popular usage of social media were communication, with 18 papers finding this [35] [111] [30] [106] [53] [55] [66] [41] [64] [39] [74] [104] [90] [105] [97] [71] [88] [42], sharing, with 15 papers [111] [30] [55] [64] [39] [74] [78] [20] [105] [98] [31] [34] [71] [88] [42], and building of community, with 11 papers [111] [30] [106] [55][66] [39] [74] [90] [20] [71] [88].

4.9.3 Risk of Bias in Studies

There is the possibility that there is some bias within these results, as some of the resources were dissertations and theses, with a specific focus on students in a specific environment. For example, Viswanathan [111] focuses on blended learning in Singapore rather than giving a global overview of blended learning.

Additionally, there is a high risk of bias from the researcher, as only one person carried out the systematic review, and there was not another user carrying it out to compare and contrast the results, which could lead to biases appearing from the researcher. This, in addition to the researchers decision to include specific criteria and themes and exclude resources and themes, leads to the conclusion that there is a high possibility of researcher bias in the paper.

4.10 Discussion

From this systematic review, we were able to obtain a wide variety of features that students employ in their day-to-day lives and to connect with other students to improve their sense of belonging. The ways that students utilise social media were also extracted. Whilst most of the opinions and experiences of students utilising social media were positive, several papers observe the possible negative experiences and repercussions students could come across when using social media such as distractions or social media addiction.

A possible limitation of the review process is that some of the papers focused on a localised set of data rather than giving a global overview of the views of students. This could imply that some of the results drawn from this review could be localised and representative of a specific population rather than representative on a global scale.

Chapter 5

User Studies

As stated before, a questionnaire was performed to obtain information about student's usage of social media platforms and the benefits and drawbacks of them, as well as some general information about their views on employing social media for a sense of belonging.

5.1   Aims of the study

This study aims to obtain information to answer RQ1b, RQ2b, and RQ3b and is modelled to follow A1 and A2.

5.2   Participant Recruitment

The target audience for this questionnaire was students in higher education who were affected by the COVID-19 pandemic throughout their higher education at the University of Edinburgh (UoE). Following the UoE guidelines, the last hybrid year was considered the academic year of 2021-2022, therefore only students who were in their third year of higher education or higher were considered. At the time this study was conducted, third-year students are currently the last cohort to have experienced at least one year of hybrid learning due to the pandemic.

Participants were recruited through university email and social media such as WhatsApp [5], Instagram [6] and Discord [7].

The questionnaire was answered by 61 students, all belonging to UoE. A total of 58 responses were considered valid, as 2 students had not experienced COVID in their university years, and one student did not employ social media. Whilst there was a representation of all years, most of the students who answered the questionnaire were fourth-year students (62.7%), 20.3% of the participants were PhD and Master students, 15.3% were third-year students, and fifth-year students comprised the remaining 1.7%.

5.3   Data collection Methods

A questionnaire was used as it can reach a wide variety of participants, which suits the aims of the project as we are investigating students' experiences employing social media. The questionnaire was hosted online on Microsoft Forms, [8] to which every student at UoE has access to. Therefore, by employing a questionnaire, we are allowing students from any school within the university to answer it, providing a wide variety of responses. Furthermore, this user study does not constitute a significant time commitment. Thus, students are more inclined to answer as they prefer methods that do not require a significant time commitment, which a focus group and interview do. Once the questionnaire is sent out it can gather responses with no involvement from the researcher.

5.4   Materials

A Participant Information Sheet (PIS) and a Participants Consent Form (PCF) were created for the questionnaire and are included in Appendix C and D. A PIS is a form designed to inform participants of what will happen and what they will need to do if they decide to participate in the study, as well as how their data will be managed and stored. It allows participants to make an informed decision after weighing the risks and benefits and allows for confirmation that the information provided is fully documented from a legal perspective. A PCF is a form that participants sign to state that they agree with the information provided in the PIS. It must be noted that participants can amend their decision to agree with the data being used following the outline of the PIS.

The design of the questions was next. As we needed a broad image of the demographic of the students at UoE affected by the COVID-19 pandemic, we would need to obtain the participant's year of study and how many years of their higher education were affected by the pandemic. Usage of social media was an important metric for this study, so the frequency of usage of social media, as well as which platforms they normally use and their primary reasons for using social media was a question. The connection between the usage of social media and the pandemic, and the usage of social media and the fostering of a sense of belonging was information that was also asked of the participants. Additionally, as we wanted to know about students' experiences, there was an opportunity for participants to describe their experiences. No personal data apart from the academic year of study was considered necessary.

Whilst some questions were closed as there were only a specific amount of possible answers, such as the academic year of the participant, some questions were open as they allowed for better qualitative research. For the closed questions, the answers were provided in a multiple-choice setting or with a standard Likert scale. A Likert scale is a psychometric scale that has multiple categories from which respondents choose to indicate their opinions, attitudes, or feelings about a particular issue [75]. This helps reduce misinterpretation and decrease bias [61]. The questionnaire was comprised of 12 questions, with 9 closed and 3 open questions.

The wording of the questions was deliberate to avoid misunderstandings on the partici-

pants' end. Easier questions relating to participants' academic situation were located at the beginning, continuing with questions about social media and the participants' social media usage, and ending with open-ended questions about their experiences with social media to create a sense of belonging. This allowed for a seamless experience for the participants.

To provide anonymisation for the participants to encourage unbiased and free of judgement answers, the questionnaire was set up so as not to take the names of the participants. The form possessed some conditional formatting to avoid allowing people who did not fulfil the eligibility criteria to fill in the questionnaire, as this would provide data that is not suited for research. This included participants whose academic year was not in the required range and participants who did not use social media. The questions of the questionnaire are provided in Appendix G.

5.5 Procedure

The questionnaire was created in Microsoft Forms, [8] and distributed throughout various social media as well as email. The questionnaire remained open for two months to allow students at UoE to answer at their own pace. Reminders about the questionnaire were sent periodically.

5.6 Data Analysis Methods

Descriptive statistics were employed in the answers that required closed answers, as they contained quantitative data. Microsoft Forms[8] performs simple descriptive analysis on the questionnaire answers, so no further analysis was required on the closed-answer questions. Thematic analysis was carried out on open-ended questions, which provided qualitative data, to obtain themes from answers from the participants to identify features from social media [29]. NVivo was utilised to identify themes within the answers [9].

A mixture of top-down and bottom-up thematic analysis was employed [29]. General themes were set following the research questions, such as features of social media, experiences, usage and higher education usage, and from there, subthemes were coded as they emerged from the text. The structure of the themes can be found in Appendix F.

5.7 Results

5.7.1 Quantitative results

When asked how many hours on average the participants spent on social media per week, 67.2% answered that they spent more than 15 hours per week, with 46.1% of them spending more than 25 hours a week on social media. The five most used social media by students were Instagram (86.2%), Discord (63.8%), Facebook (37.9%), Snapchat (37.9%) and Twitter (34.5%). The students mainly employed social media to keep in contact with friends and family, fill their spare time and find content. This answers

RQ2b.

Most of the respondents agreed that their social media usage increased during the pandemic, but they did not consider it to have a positive impact on their lives. 39.6% of participants considered that social media had a negative impact on their life whilst only 20.7% considered it had a positive impact. Whilst 79.3% of participants agreed that the pandemic had impacted their sense of belonging, and 50% of the students agreed that social media helped them maintain and create a sense of belonging in higher education, the rest of the participants disagreed or abstained from commenting. This answers RQ1b.

5.7.2 Qualitative results

The questionnaire had some open-ended questions to allow respondents to provide explanations and thoughts about their responses. Four main themes were obtained, which will be expanded in this section. The themes identified within the responses were experiences, features of social media, university sectors and usage of social media. This answers RQ3b.

5.7.2.1 Experiences

This theme deals with students' experience with social media, and whether their experiences were positive, negative or neutral, which we identified as subthemes. This was to see what kind of experiences students experienced using social media. From 59 respondents, 42 negative experiences were recorded, 27 neutral experiences were recorded, and 37 positive experiences were recorded. If a student had conflicting feelings or talked about separate situations within the same answer, it would be coded into two or more separate themes.

Students at UoE who experienced neutral experiences with social media tended to view social media as a tool, and they spoke of how they utilised it, without mentioning if they found it particularly useful or not. For example, Participant 1 (P1) remarked that "*Clubs and societies post updates on Facebook*", whilst P20 commented that "*It was my primary way of keeping in contact with friends at university in first year*" when prompted why Discord [7] was the social media that helped the most with a sense of belonging. When speaking about their experiences, they didn't necessarily reflect on whether the features of social media were beneficial or not, even if they classified it overall as a positive experience, they talked about it as if it were a tool.

Students who had negative experiences with social media had their experiences stem from different situations within social media. Nine students out of 59 shared that they did not like the content that was shared through social media, with P28 saying that social media showed them experiences that they could not experience ("*I'd say that social media sometimes showed the life we were missing because of covid*"), and P37 sharing that seeing other users do activities that they couldn't do, did not help them emotionally ("*I really struggled seeing others breaking the restrictions or just having a much nicer flat family in first year*"). Twenty students had issues with the effects that social media had on them, with one of them remarking that "*Social media use has brought me into*

social media addiction" (P39), another one stating "*endless scrolling is addicting. It makes me less productive and I can barely get anything done*" (P46), and P57 divulging that "*it (social media) caused additional stress and anxiety to many*". Another point to remark was that three students had issues with the people that utilised that particular social media, with P48 sharing that users attack each other on the platform, ("*some individuals choose to use these platforms (TikTok and Instagram) to attack others.*"), whilst P44 said that Discord [7] was not as welcoming as they expected due to the users ("*I expected it (Discord) to be more open and friendly but it was honestly a toxic circle jerk during the pandemic*"). From the analysis, it seems as though the negative experiences the students at UoE had with social media did not stem from the features of social media, but rather from what social media enabled users to do.

Students who had positive experiences with social media focused on the different uses that social media offered. Seventeen students of the 59 respondents commented on the usefulness of social media to meet different people in their courses, such as P12, who remarked that it was helpful in meeting other students, which would not have happened through online learning ("*Met other students, which I would have not done much through online learning*"), and P18 stated that meeting and befriending their cohort helped as they could ask questions about career paths and university administration ("*Our year group server over Discord has helped me immensely in meeting new people from the university, befriending them, asking for help and guidance in dealing with the university administration as I was quite uninformed on the matters in my first year, and in careers related advice without which I would not be as successful in pursuing my path in the field.*"). Eleven students brought up the point of being able to keep in contact with friends, such as P19 saying "*Was able to keep in contact with a wide group of peers, even when working remotely or during lockdown.*", and P55 agrees that "*It (Discord) helps me to keep up with my classmates.*" Two students talked about their experiences with learning through social media, "*Good platform for aiding me learn and also keeps me entertained.*" (P60), seven students remarked that social media helped them feel connected, "*gave me the impression that I'm not alone*" (P57), and one student stated that it helped them build a sense of familiarity with their peers, "*image-based posts helped to build a small sense of familiarity with our peers.*" (P56). From the analysis, it seems as though the majority of positive experiences with social media stemmed from the usage of social media rather than the features it has, although it can be argued that features of social media enable these experiences.

5.7.2.2 Features of Social Media

This theme deals with the features of social media that students at UoE used when using social media. The features identified within the answers to the survey were as follows:

Accessibility: Accessibility is the design of products, devices, services, vehicles, or environments to be usable by people with disabilities. [52] One student, P16, remarked that some platforms being less accessible than others skewed the users they met through them ("*Discord being relatively less accessible compared to the rest of the listed social media options skewed the people that one would meet through it.*")

Community: Six students out of the 59 made references to social media helping them

feel connected with other students, coursemates and users at a global scale. P57 stated that "*...gave me the impression that I'm not alone and there is this global community feeling similarly with me.*", supporting the feeling of feeling connected through social media. Three students commented that they could feel connected to a greater community, whilst two others found the ability to make channels and groups within social media to be very useful in creating communities.

Events: During the pandemic, events were hosted online and on social media, and they were made accessible by users posting information about said events on social media. Two students said that this helped them feel a sense of belonging, with P37 remarking that "*All of my sense of belonging came from engaging with the university's sports union and sports clubs over Instagram and WhatsApp.*", as different societies hosted events online in a bid to help students feel more connected within universities.

Post Features: Seventeen students out of the 59 utilised different post features to communicate and engage with other students through social media. P56 recalled that image based posts helped him build familiarity with other users, ("*...the image-based posts helped to build a small sense of familiarity with our peers*"). Whilst some of the seventeen students mentioned utilising comments, multimedia posts, reactions, sharing and uploading of posts to communicate with other students, comments were considered the feature with the most positive results. Apart from this, students used different types of posts such as calls, images, texts, videos, stories, memes and live streams to connect with other students, which they found increasingly helpful when creating a sense of belonging.

Profiles: The ability to create profiles on the respective social media platform was a feature that was regarded as positive and negative by students. One student appreciated the fact that they could create a profile that is unique to the user and allows them to personalise it to their will. However, three students stated that they did not like the fact that users could create a profile that does not contain personal information about the user, which they referred to as a depersonalised profile, as a negative feature.

Usability: One student also commented on the fact that social media was "*low commitment and barrier to entry*", (P8), and was therefore deemed as a very viable option for students to employ to communicate with other students.

Customisable Servers: Three students stated that creating customisable servers was a good feature as it allowed them to separate different courses and topics from each other, helping them feel more connected to that specific course.

5.7.2.3   Students Interaction with UoE through Social Media

This theme explores how students utilise social media to connect with different aspects of the university. From the answers, students utilised social media to connect with higher education in four ways: with their universities, with university societies, with their course-mates or for personal usage.

Sixteen students out of the 59 interacted with their university in various ways, mainly through announcements, for example, P11 shared that the university posted announcements and activities on social media ("*Our college posted contents and activities through*

social media to ensure that everyone knew that everyone's in the same situation, and we have each other during hardships"), but the main consensus was that the university college in itself did not have a lot of presence on social media "*I did not come across almost any university and school related material while using the platform.* (P16), or that students did not interact with the university via social media, "*No engagement with the university or anything along those lines*" (P4).

Ten students out of the 59 connected to their university societies employing social media, and their experiences with this were positive, with P22 saying that social media helped them find a strong community ("*University societies used Discord, and I was able to find a strong community there which transferred across to the real world post-Covid!*"), and P37 stating that by engaging with societies through social media helped them create a sense of belonging ("*All of my sense of belonging came from engaging with the university's sports union and sports clubs over Instagram and WhatsApp.*").

Thirty students out of the 59 participants interacted with other students via social media, as P9 said that social media was the best way to keep in contact with other students ("*Texting within school groups was basically the main way to keep in contact with other students*"), and P33 said that using social media to communicate was the only source of contact with other course mates ("*My year's discord server was the only real source of contact I had with other people taking my courses. Having started uni during the pandemic, I barely knew anyone in person at all.*"). It is hard to discern whether students had an overall positive or negative experience, as it depended on the specific interactions they had in the platforms, and with whom they had them.

Finally, thirteen students utilised social media for personal reasons, such as staying in contact with their friends throughout the pandemic "*Main way I interacted with friends whilst isolated physically.*" (P14), or P48 sharing that social media helped them meet and connect with new users ("*Discord has been a wonderful platform for me to connect with new friends who share my passion for gaming.*"). They also used social media to connect with people outside of the university, "*Discussing with other people and seeing their reactions to all the sad news during Covid, gave me the impression that I'm not alone and there is this global community feeling similarly with me.*" (P57). Whilst there was a wide variety of ways students could utilise social media for personal reasons, it was mostly to keep in contact with other people.

5.7.2.4 Students General Use of Social Media

This theme evaluates how students employ social media and for what purposes. These are obtained from the open answers that participants gave and are separate from the question of how students utilise social media, as we are analysing themes from their experiences rather than analysing data from a pre-selected section of possible uses of social media. Students utilise social media in the following ways: to ask other students for help, avoid loneliness, build a community, communicate, game with other students, connect with people, create impressions, create specific servers, develop a culture, engage with other students, attend events, learn different subjects, meet different people, misuse social media, obtain updates, post content, sharing of content, staying in contact with other users, tracking or monitoring, contributing to university courses, usage of

social media to procrastinate, and to watch videos or live streams.

The most popular uses of social media were to connect and engage with other students, communicate with course mates and obtain updates. Out of the 59 students who responded to the questionnaire, twenty-seven students used social media to connect and engage with other students, twelve students communicated with course mates and nine students utilised social media to obtain updates.

5.8 Summary and Conclusions

From the filtered 59 responses to the questionnaire, we were able to glean different opinions and experiences about students' usage of social media for a sense of belonging during the pandemic. Whilst students at UoE reported a significant amount of negative experiences, these were linked to the effects that social media had on them such as social media addiction, the users encountered on social media, and the specific information such as news users encountered in social media. Positive experiences relating to a sense of belonging talked about the communities they created within social media platforms and the connections they formed with other users. Comments, video calls, communication with other users, and engagement with events and posts in social media were the features that were recognised as the most useful ones when it came to fostering a sense of belonging.

There were some parallels between the findings of the systematic review and the questionnaire. The features found across both studies were almost identical, with Alerts being the only feature that was mentioned in the systematic review only. Whilst both studies mostly agreed on the sentiment behind the different features and whether they were considered desirable, there were two features that the studies did not agree on, which were Servers and Profiles. Students at the UoE had a negative experience with them in the questionnaire, whilst studies found them desirable. This can be attributed to the fact that students at the UoE had a bad experience with those particular features, which can be observed from their responses, and therefore had biased views towards them and thus did not represent the views of the general student population. The rest of the features were considered to be beneficial by both studies.

Chapter 6

Evaluation

To evaluate how effectively the most popular social media implemented (at the time of writing this dissertation) the different features which were considered desirable, an evaluation was carried out. To do so, a list of desirable features was decided, a selection of social media was selected, and an account was created for each of them. If the social media possessed the desired feature and implemented it in a way that is easily available to users, it obtained 1 point. If the social media platform possessed the desired feature but implemented it in a way that is not easily available or did not implement it in the most accessible way, it obtained 0.5 points. If the social media did not possess or implement the feature, it obtained 0 points.

Each social media obtained an overall score and a score relative to each feature. By doing so, we allowed social media to be classified according to overall best score and classified them by desirable features. This allowed us to see which social media platform possessed the highest number of desirable features, see how each social media implemented each feature and which social media was best per feature.

This evaluation aligns with RQ4 and RQ5, as we observed how social media applications compared in terms of desirable characteristics and by observing how different platforms measured up in terms of characteristics, we were able to evaluate what design elements could be added to specific social media platforms to enhance their design and have features that enhance student's sense of belonging.

Twenty different social media platforms were obtained from the systematic review and the most popular ones were chosen to be evaluated. These were decided by finding out which platforms were mentioned the most uniquely throughout the systematic review. Combining these with the mentions from the questionnaire, the five most popular social media platforms were chosen. These platforms were Facebook, Instagram, Discord, Snapchat and Twitter. [4] [6] [7] [10] [11]

A full evaluation of the features from both the systematic review and the questionnaire is included in Appendix B. However, for the main evaluation, only features obtained from the systematic review would be included.

To decide which features are considered desirable from social media, the experiences of students employing social media were used from the systematic review. The features

were observed at a general level, rather than delving into the sub-features, as it might be more helpful for platforms to see how they are doing overall rather than a specific level. This was done as each platform has a different model for their platform, therefore, the way that they might implement a sub-feature could be completely different to how another platform might do it. All of the features obtained from the systematic review were put into a list. These are Ability to Message, Accessibility, Aesthetic, Alerts, Availability, Community, Cost, Events, Multi-platform Compatibility, Security Features, Privacy Options, Profile Creation, Post Features, Types of Posts, Servers and Usability.

As stated in the systematic review, each experience was classified into a positive, negative or neutral experience. A feature was considered desirable if at least 70% of the students' experiences with social media from the systematic review were either positive or neutral. This is because an experience was classified as positive if the student had a positive interaction with the feature or by employing the feature, and a feature was classified as neutral if the student employed the feature but did not have a positive or negative inclination towards the feature, regarding it as a tool. The threshold was set at 70% per cent, as the sentiment behind the feature must be considered overwhelmingly positive. Furthermore, neutral experiences were included in the threshold as many students considered features as an integrated part of social media, therefore they consider them as tools that must function and do not consider whether they should have a positive or negative connotation to them. By setting this threshold, only one feature was removed, which was Alerts, as the studies that mentioned this feature stated that it helped promote excessive use and checking of social media [40]. Each specific experience with a tool was only counted once per paper, that is, if a paper repeated continuously that a feature was positive, it was only counted once. However, if the feature was utilised in different ways and the paper reported different experiences with it, these were counted individually. This was done to avoid possible bias from papers from repeating results.

It is also noted that the most desirable features of social media platforms are aesthetic, accessibility, availability and types of posts, as when the percentage of neutral experiences are removed from the total, they are the only features that still pass the 70% threshold. Therefore, they are considered the most desirable features from the features observed from the systematic review.

A caveat in this evaluation is that whilst Alerts is observed to be an undesirable feature, it is still included in the evaluation as students still employ this feature even if it leads to less desirable interactions with the platform. Therefore, a score for both evaluations was produced, however, this does not affect the overall ranking for the platforms.

An account was created in each platform and each feature from the list was evaluated. Table 6.1 comprises the scores that each platform obtained per feature. Table B.1 includes a more detailed evaluation, with insight as to the sub-features of each feature.

	Facebook	Instagram	Snapchat	Discord	Twitter
Ability to Message	5	5.5	3.5	5	5.5
Accessibility	0.5	0.5	0.5	0.5	0.5
Aesthetic	1.5	2	1	2	2

Availability	1	1	1	1	1
Community	5	4.5	4.5	5	4.5
Cost	2	2	2	2	2
Events	2	1	1	2	1
Multi-platform Compatibility	1	1	1	1	1
Security Features	1	1	1	1	1
Privacy Options	1	1	1	1	1
Profile Creation	2	2	2	2	2
Post Features	10.5	10	5.5	7.5	10
Types of Posts	1	1	0.5	1	1
Usability	5.5	6	6	5	6

Table 6.1: Evaluation of social media based on features

The results from the evaluation are as follows:

	Facebook	Instagram	Snapchat	Discord	Twitter
Total Points including Alerts	40	39.5	31.5	36.5	39
Total Points exc. Alerts	39	38.5	30.5	35.5	38

Table 6.2: Sum of Points of the Social Media Platforms.

From Table 6.2, we can observe that Facebook [4] obtained the best score, followed by Instagram [6], Twitter [11], Discord [7] and Snapchat [10]. Facebook obtained a better score than the other platforms due to its event features, implementing the specified post features more efficiently and providing the ability for users to customise large groups and servers, thus helping in the sense of community. It is not surprising that Snapchat has the lowest score from the evaluation, as the model behind Snapchat is that messages are only available for a short period, making it not very useful when you want to communicate with a large group of users over a long period. Additionally, the limit of 32 users per group does not aid users in creating and communicating with large groups of users.

Instagram and Twitter had the highest scores in Ability to Message, as they allowed for public messages as well as private messages, and allowed for comments on posts. All platforms had the same score in accessibility, as whilst when accessed through a laptop it can be more accessible, mobile social media is still difficult for users with disabilities to manage [45]. When it came to Aesthetic, Discord, Instagram and Twitter were the

highest-ranking platforms as they had clean content and were visually appealing. There is a high possibility of bias within the evaluation of this feature. All platforms had the same score for Alerts as they all similarly implement them and with Community, Facebook and Discord had the highest score as they allowed for good moderation tools and customisable servers and groups.

All platforms are free of cost and also offer premium services, therefore they had the same score on cost. Facebook and Discord scored the highest in events as they allow users to host different events within the application, and create specific posts and pages about events to which users can RSVP. In Multi-platform Compatibility, Security Features, Privacy Options and Profile Creation all platforms offer the features to the same level of competency, even if they might be implemented differently, thus they all obtained the same score. Facebook obtained the highest score in Post Features, as it implemented all of the sub-features perfectly, except the download of posts, which all platforms do not implement to completion. Finally, Facebook, Instagram, Discord and Twitter allow users to post different types of posts, so they obtain a full score, and in usability, Instagram, Snapchat and Twitter obtained a full score due to them offering the most seamless interactions out of all the platforms.

Whilst Facebook might indeed have the highest score, there is also something that must be noted when it comes to the evaluation, and it is the fact that societal views are very much active. Facebook tends to be considered a social media platform for older users, whilst younger users tend to prefer Instagram and Snapchat [51] [16].

When looking at design elements or features that could be added to current social media platforms to enhance students' experience were a situation like the pandemic arise again, two features could be added to all social media platforms.

First of all, whilst social media platforms allowed for the sharing of various resources, just one of the platforms evaluated, Discord [7], gave users the ability to share PDFs through the platform. Whilst you can share PDFs as images on the rest of the platforms, sharing PDFs is useful for students as they can share course notes and resources with other students. Therefore, it would be beneficial for platforms to adapt their existing sharing feature to include this as it would aid students in the future.

Secondly, apart from Facebook [4] and on a much lesser scale Discord, [7] none of the other three platforms allowed users to provide a specific event page that contained information about events or gave users the ability to host events through the social media platform. Both participants in the questionnaire and studies from the systematic review observed that students enjoyed hosting and participating in online events during the pandemic, and it contributed to their sense of belonging. Platforms could benefit from including or incorporating this feature, as users appreciate it.

Chapter 7

Discussion

7.1 Project Achievements

In this paper, features of social media that promote a sense of belonging or aid in creating a sense of belonging during the COVID-19 pandemic in higher education were extracted from literature using a systematic review, and experiences of students at UoE employing social media for a sense of belonging during the pandemic were obtained with a questionnaire. The use of these methods allowed for a rich extraction of features and social media and each social media platform was evaluated based on whether they contained these features.

Out of all of the features obtained from the systematic review, only one did not pass the threshold of at least 70% neutral and positive experience, and this feature, Alerts, is considered to not be beneficial as it incites users to continuously update their social media. In addition, four features were identified as extremely desirable, these being aesthetic, accessibility, availability and types of posts, as they passed the 70% threshold only with positive experiences, implying that any experience with this feature is more than likely to be positive.

Out of the five social media platforms that were evaluated, the highest-ranking one was Facebook[4], followed by Instagram [6], Twitter [11], Discord [7] and Snapchat [10]. This can be attributed to the model of Snapchat, which is based on messages and pictures disappearing after being viewed for a specific period.

The research and evaluation allowed for a comprehensive set of features of social media that were beneficial to students in higher education to create and maintain a sense of belonging during the COVID-19 pandemic, as well as a comparison of popular social media platforms and a resulting set of guidelines. This will be useful for researchers who wish to investigate and research this topic further; designers who wish to expand or improve the features of social media platforms; and universities who want to invest in the use of beneficial social media platforms for their students. All in all, the design, development and use of platforms deploying the beneficial features and incorporating the guidelines presented in this dissertation could help students obtain a feeling of belongingness in higher education.

7.2 Challenges Faced

Along with the completion of this project, different challenges arose and had to be addressed.

First of all, the direction of the original project was very vague. It focused on students' experiences with social media during the pandemic, however, this allowed a wide variety of experiences and observations to be made, with no clear way forward. Furthermore, from a quick literature research students had different views on whether social media was beneficial for them or not during the pandemic. Thus, it was decided that a specific experience or feeling of students needed to be explored to delimit the area of research. After some additional research on the pandemic, I came across the fact that students' sense of belonging had been affected by the pandemic, therefore, I thought that it would be interesting to see how social media helped students bridge this gap. This also helped delineate the direction of the project.

Secondly, when it came to the systematic review, the original keywords gave over 16.000 results (social media, sense of belonging, higher education, COVID). They needed to be more specific as, due to time constraints, the objective was to get under a thousand results. To do so, different approaches and keywords were discussed with my supervisor to finally obtain a combination that gave under a thousand results, as it would be unfeasible to conduct a very long response with the limited time given to complete this project.

A focus group was also meant to be conducted to have a more holistic view of students' experiences, even if they would only relate to the views of students at the UoE. However, due to time constraints, this was not possible in the end, and as the data from the questionnaire was rich enough to allow for good analysis, the focus group was considered to be a point of future work for this project.

Finally, there were some challenges when it came to the evaluation. Due to time constraints, it was not feasible to evaluate all platforms, therefore, the most popular ones were selected. The most mentioned social media in literature were selected, as well as the most preferred social media from the questionnaire. Whilst there are many ways to do this, this was done as it seemed the most just and conventional way. Furthermore, when discerning what features are beneficial for students, there was a limitation that if only positive experiences were considered for the evaluation, there would be a very small amount of features that passed the threshold. Therefore, neutral experiences were also considered for the evaluation.

7.3 Experience with Methodology

The methodology employed in this project was appropriate for the topic. A systematic review was needed since social media is a widely used term, and is integrated so much into our society that many of its features are considered an integral part of social media which can be taken for granted. By completing a systematic review, we were able to obtain features from social media that students employ in their daily lives, and whether these experiences were considered positive or negative. If this project were

to be repeated, a systematic review would still need to be carried out. This was also the first time I had conducted a systematic review. The experience overall was very positive. The systematic way of planning the research and having a clear set of goals and criteria helped when deciding which resources were useful and which were not. I did struggle with the planning of it, as I had never used it before, and the sheer amount of results overwhelmed me in the beginning, but this was overcome by planning and slowly managing the workload.

As for user studies, this will be expanded in more detail in the following section, however, if this project were repeated, a questionnaire would still be used. A questionnaire allows for a wide amount of responses to be collected with relatively low effort and time, as well as allowing a wide variety of respondents to take part in the user studies. This was beneficial for the researcher as well as it allowed for responses to be collected with no significant time commitment. For this project respondents were limited to students at the UoE, which represents the population and opinions of the University and might not be an accurate sample of students worldwide.

7.4 Conclusions

This paper investigated features of social media that helped aid students in creating a sense of belonging in higher education during the pandemic. This area of research has not been looked into extensively, and it is an area that should be investigated more deeply, as the sense of belonging is a human necessity, and the COVID-19 pandemic affected this need severely as human contact was reduced significantly. As stated in the background chapter, students were severely impacted by the pandemic and were a particularly vulnerable group, which means that the impacts of this pandemic on their sense of belonging could have repercussions later on in life, which begs for research to be done in this area. In this section, an overview of the RQs will be provided, and a formal answer for each question will be provided.

- How has the pandemic affected the sense of belonging for students, and how has students' usage of social media helped bridge that gap? According to the literature and according to the UoE.

This research question was explored in Chapters 2 and 5. The pandemic enforced several social distancing and lockdown restrictions, reducing physical contact and interaction with other students, which are an essential part of creating and fostering a sense of belonging. Several participants in the questionnaire stated that their use of social media helped them connect with other students in their university, and helped them form connections which then translated to the real world post-pandemic. These connections spanned people in different degrees and different sports clubs.

Literature states that students' usage of social media increased during the pandemic, as it was a way to connect with other students and users with lockdown restrictions implanted. There is some disagreement about the matter of the pandemic affecting students' sense of belonging, with Gopalan, Linden-Carmichael, and Lanza [46], for example, stating that there was not an effect on students' sense of belonging due to the pandemic, whilst Mooney and Becker [72] stating the opposite, that students' sense

of belongingness did fall during the pandemic. As literature is still investigating the impact of the pandemic on various topics, it is not unusual for some papers to disagree.

However, data from the questionnaire aligns with what Mooney and Becker [72] state, that the pandemic affected the sense of belonging of students in UoE. 79.3% of students agreed that the pandemic had affected their sense of belonging, and a further 50% stated that social media helped them maintain a sense of belonging. Furthermore, 43.1% of students said that social media helped them create a sense of belonging, therefore implying that social media had a positive impact when it comes to nurturing and creating a sense of belonging, at least for students at the UoE.

- What were students' preferred social media platforms for creating a sense of belonging during the COVID-19 pandemic? According to the literature and according to the UoE.

This was observed in chapters 4 and 5. According to the literature obtained from the systematic review, students' most utilised social media for a sense of belonging was Facebook[4], followed by Instagram[6] and Twitter[11]. This data was obtained by seeing how many times a platform was uniquely mentioned across all papers.

Based on the questionnaire, students' preferred social media platform for creating a sense of belonging was Discord[7], followed by Instagram[6]. However, there is the possibility that this result is biased, as the questionnaire was distributed only among UoE students and mostly among the School of Informatics. Therefore, there is a high possibility that these results reflect the views of a select division within the University.

- What were the characteristics of social media platforms that were seen as beneficial for students during the pandemic? According to the literature and according to the UoE.

This was observed in chapters 4 and 5. A total of 15 main features were identified, with a total of 36 sub-features. These were found by completing and analysing a systematic review and analysing the responses from the questionnaire. From these, only one was considered negative from both sources, which is Alerts. Participants in the questionnaire had negative experiences with servers and profiles, however, the papers found in the systematic review found them to be desirable, which could imply that the participants simply had a bad experience with them, rather than reflecting the views of the population.

Literature found that beneficial features for students included Ability to message, Accessibility, Aesthetic, Alerts, Availability, Community, Events, Platform Compatibility, Post Features, Privacy, Profiles, Security, Servers, Usability and Types of Posts, whilst the questionnaire found that beneficial features for students at UoE included Accessibility, Community, Events, Post Features, Types of Posts and Usability.

- How do social media apps compare regarding their beneficial characteristics in RQ3a?

This was observed in Chapter 6. Five social media platforms were evaluated, as they were the most used by participants who completed the questionnaire, as well as the most popular social media platforms from the systematic review. These platforms were

Instagram[6], Facebook[4], Discord[7], Snapchat[10] and Twitter[11]. The platforms were evaluated based on the features that appeared in the systematic review, as it's clear that the features obtained from the questionnaire were representative of the features that students at the UoE employ, rather than the views of students worldwide. The platform with the highest evaluation was Facebook, and Snapchat had the lowest evaluation. This was hypothesised to be due to the communication model for Snapchat, which prioritises disposable messages. Additionally, the fact that Facebook is not utilised by students as much as Instagram or other social media platforms is a point of interest.

- What design elements could be added to current social media platforms for them to enhance the student's sense of belonging in contexts similar to the pandemic?

This was observed in chapter 6. Whilst the desired features are already well implemented, there are two that could be improved to enhance students' experience. The first is the sharing of resources. Social media platforms allow for the sharing of multiple formats of resources, however, only a small portion of those allow the sharing of PDF files. This is useful for students as it allows them to share class notes and resources, therefore it would be desirable for platforms that do not allow this already to implement it.

The feature that could be improved is the hosting and sharing of events. The evaluation highlighted that Facebook was especially preferable for this feature as it allowed them to create pages for events which allows event hosts to promote and provide details about the event, and Discord, as it provides a simple event-creating notice and page. Social media platforms would benefit from improving this feature as the other platforms that were evaluated did not contain this feature.

7.5 Future Work

7.5.1 Limitations of this study

There were some limitations to this study that will be addressed, as some of them could be worked on in the future.

With the user studies, whilst the questionnaire was the most appropriate method, the number of responses was relatively small. If I were to repeat this study, I would market the questionnaire more aggressively and on more social media platforms. Furthermore, the questionnaire was limited to students at the UoE, and most of the participants were in their fourth year of university as the questionnaire was promoted mainly through the School of Informatics. There is the possibility that it is a biased data set, as many students might have had a similar experience with social media.

The questionnaire could be shared with students in different universities and different schools. There is conditional formatting within the questionnaire so that it filters out students who do not fulfil the requirements for the study, such as they must use social media and they must have experienced the pandemic in at least one year of university, therefore this could be carried out quite easily. Additionally, some students answered the questionnaire with answers that were not relevant to the question asked, therefore sometimes the data collected from the answers was not as useful as we had hoped.

This could be improved by adding definitions of the terms we were obtaining data about, creating more detailed questions or employing other methods in addition to the questionnaire.

By expanding this research into other universities as well, maybe even countrywide, it would be possible to observe students' experiences more generally and with a wider variety of experiences as these will vary from country and university. Doing this will allow for a more representative data set when it comes to representing the views of students' use of social media for a sense of belonging in higher education during the COVID-19 pandemic. The data obtained from the questionnaire can only be considered representative of the opinions of students at the UoE.

Furthermore, due to the way the questionnaire was distributed, there is a high possibility that the majority of respondents belong to the School of Informatics at UoE as that is where it was mainly promoted. Whilst we cannot discount the possibility that participants belong to other schools, it might be possible that the questionnaire results are representative of a subset of the university rather than the university as a whole. The inverse is also possible, that they are representative of the university as a whole rather than a subset of the university. However, as the questionnaire did not have a question about the degree of the participant, there is no way of knowing if this hypothesis is right. This could be addressed by including a question about the degree of the participant. If the questionnaire was expanded, it could add to the data obtained from the systematic review and provide a more holistic view of students' opinions and experiences.

Furthermore, the data obtained from the systematic review was satisfactory, however, several key terms could be added to produce more detailed information about the features of social media that students find desirable. The inverse could also be said, as some terms were added to reduce search results, but if they were removed, whilst the number of resources would increase, there would also be a wider amount of results. For example, university was not considered a keyword because higher education is a more inclusive word when it comes to university teachings, however, it is not a term that is used a lot in more informal papers, such as dissertations and theses, therefore, it is possible that some papers were excluded due to the exclusion of this term.

Finally, we note that the versions of the social media platforms utilised in the evaluation are not the same as the ones that students utilised during the pandemic, therefore new features may have been added since then, but as there is no way to access the previous versions, the evaluation was done in the best possible way. This research can inform how current platforms would perform if a new lockdown occurred.

7.5.2   Future Work

A point of future work for this project is the inclusion of other user studies. A focus group could be employed to obtain student experiences in more detail. Whilst the questionnaire is very effective in obtaining a large number of answers from a very varied population, there is a limit to the data we can obtain from it, especially as students do not tend to answer fully within the open-ended questions in the questionnaire. Performing a focus group, even if it would be a time-consuming endeavour, would provide more detailed experiences from the participants, and would allow for the researcher to ask

specific questions about the usage of social media and its features, as participants would be able to share their experiences and comment on other participants experiences, as well as detail how they employ certain features and why they find them useful or harmful. Additionally, by interacting with other users, they can bring up experiences and start a conversation about their experiences, providing rich data about experiences. In a focus group, the facilitator can ensure that different opinions are heard and that more verbal people don't drown the conversation for others, ensuring that every participant's opinion is heard. An interview would also be useful as it would be helpful to obtain information about the usage of social media without being biased by other participants.

Additionally, as stated before, 15 social media platforms were found throughout the systematic review and the questionnaire. Of these, only 5 were evaluated, as those were the most popular social media according to the questionnaire and the systematic review. As stated in the limitations section, it is very possible that the data from the questionnaire was biased, therefore, evaluating more platforms or performing the evaluation again after obtaining more responses from the questionnaire would produce better results. However, as we are investigating the characteristics of social media that literature and students of UoE find beneficial per RQ3, it was considered beneficial to include both opinions in the evaluation. Furthermore, by evaluating more than the five platforms it might be helpful to observe more platforms to observe how different platforms implement the different features.

Interviews could be carried out to ask students about specific experiences with specific social media platforms. By asking several students in-depth about their experiences with a specific social media platform and its features, a more detailed evaluation could be obtained for each platform and feature. Similarly, there could be an in-depth systematic review of the data of each tool as well.

Investigation into the usage of social media would also be a future avenue for this project. As seen before, whilst Facebook is the best scoring platform, it was not the most popular platform amongst students. Investigating whether different students use different platforms based on their degrees could help personalise findings even more.

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Appendix A

Features of Social Media Platforms and their Experiences

In this section of the appendix, the experiences of the high-level features of social media are classified by their connotation. They are separated into experiences obtained from the systematic review and experiences obtained from the questionnaire.

The experiences obtained from the systematic review are as follows:

Features	Total Experiences	Positive Interactions	Negative Interactions	Neutral Interactions	Total Positive and Neutral	Total Positive
Ability to message	22	6	1	15	95.45	27.27
Accessibility	11	8	0	3	100	72.73
Aesthetic	4	4	0	0	100	100
Alerts	1	0	1	0	0	0
Availability	1	1	0	0	100	100
Community	16	4	1	11	93.75	25
Cost	3	2	0	1	100	66.67
Events	2	1	0	1	100	50
Platform Compatibility	2	1	0	1	100	50
Post Features	35	8	2	25	94.29	22.86
Privacy	1	0	0	1	100	0
Profiles	22	5	1	16	95.45	22.73
Security	1	0	0	1	100	0
Servers	9	5	0	4	100	55.56
Usability	23	12	1	10	95.65	52.17
Types of Posts	26	23	0	3 8	100	88.46

Table A.1: Experiences of features of social media from systematic review to two decimal points

The experiences obtained from the questionnaire are as follows:

Features	Total Experiences	Positive Interactions	Negative Interactions	Neutral Interactions	Total Positive and Neutral	Total Positive
Accessibility	1	1	0	0	100	100
Community	7	4	2	1	71.43	57.14
Events	5	2	0	3	100	40
Post Features	17	8	5	4	70.59	47.06
Types of Posts	7	0	0	7	100	0
Profiles	3	0	2	1	33.33	0
Servers	3	1	2	0	33.33	33.33
Usability	2	1	0	1	100	50

Table A.2: Experiences of features of social media from questionnaire to two decimal points

Appendix B

Evaluation of Social Media Platforms

This section includes the full evaluation of the social media platforms. All of the features obtained from the systematic review and questionnaire were joined into a single list. Similar features were merged with a comprehensive title, and 15 main themes of features were obtained. These are Ability to Message, with 7 sub-features, Accessibility, with no sub-features, Aesthetic with 2 sub-features, Alerts with no sub-features, Availability with no sub-features, Community with 5 sub-features, Cost with 2 sub-features, Events with 2 sub-features, Multi-platform Compatibility with no sub-characteristics, Security Features with no sub-features, Privacy Options with no sub-features, Profile Creation with 2 sub-features, Post Features with 11 sub-features, Types of Posts with no sub-features and Usability with 6 sub-features.

The purple-coloured rows are the main thematic features obtained from the systematic review and the questionnaire.

Feature	Face-book	Insta-gram	Snapchat	Dis-cord	Twitter	Comments
Ability to Message	5	5.5	3.5	5	5.5	
Private Messages	0.5	1	1	1	1	Facebook obtains half a point in this section because the mobile app does not provide an integrated messaging service, but provides a separate application for private messaging

Public Messages	1	1	0	1	1	The term public messages is a little bit subjective, as depending on the setting of your profile, the term public varies as it can mean the entirety of users in the platform or only users that follow your profile. Snapchat does not allow sending public messages, however, you can post public stories to the user's profile which followers can see and can post public stories on Snapchat's map which any user can see.
Emojis	1	1	1	1	1	All social media platforms allow users to utilise emojis, but some platforms like Discord and Snapchat allow to customise emojis.
Comment Features	1	1	0	0	1	Snapchat and Discord do not allow to post comments on posts.
Specific Messaging Platform	1	1	1	1	1	Facebook has Facebook Messenger, a separate application which specifically allows users to send messages.

Sharing of Resources	0.5	0.5	0.5	1	0.5	All platforms allow users to send resources through the platform, which include pictures and videos, however, only Discord allows users to send PDFs, which is especially useful to students.
Accessibility	0.5	0.5	0.5	0.5	0.5	All social media platforms considered in the evaluation have a corresponding social media web platform, which allows users with disabilities to navigate the platform with more ease, however, the mobile platforms hosted on mobiles still remain harder to navigate for users with visual impairments.
Aesthetic	1.5	2	1	2	2	This feature is highly subjective, as it is taking into account the evaluators personal preferences, and there is a possibility that there is a significant bias from this feature.
Clean Content	1	1	0.5	1	1	
Visually Appealing	0.5	1	0.5	1	1	
Alerts	1	1	1	1	1	

Availability	1	1	1	1	1	
Community	5	4.5	4.5	5	4.5	
Contacts or Followers	1	1	1	1	1	
Networks or Groups	1	1	1	1	1	

Availability	1	1	1	1	1	
Community	5	4.5	4.5	5	4.5	

Moderation	1	1	0.5	1	0.5	Facebook, Instagram and Discord allow users to report any messages and posts made by users, as well as different user profiles. Snapchat moderation can be harder as the concept of Snapchat relies on messages disappearing after being seen by users or after a specific period. Twitter moderation is considered the least useful from a user's point of view, as Twitter only considers removing posts and users if they violate their own terms and conditions, with several reports stating that the moderation in Twitter is incredibly lax, allowing for messages that would be banned on other platforms. Jhaver et al. [56] Teyssandier [106]
Private Groups	1	1	1	1	1	

Customisable Servers or Groups	1	0.5	0.5	1	0.5	Facebook and Discord allow users to customise groups to a wide extent, however, Snapchat, Instagram and Twitter have a limit of users that can be added to groups, with Instagram allowing 32 users per group unless you are an influencer user profile, Twitter has a 100 user limit, and Snapchat has a 200 user limit.
Cost	2	2	2	2	2	This feature is two-faced because student users will want the platform to be available freely and not at a premium, however, all platforms offer specific services at a premium.
Free	1	1	1	1	1	

Premium	1	1	1	1	1	Facebook offers the possibility of removing ads at a premium, Instagram offers business tools at a premium, Snapchat offers bonus features at a premium, Twitter offers bonus features at a premium and Discord offers a subscription which allows for bonus features.
Events	2	1	1	2	1	
Hosting of Events	1	0.5	0.5	1	0	Facebook allows you to live-stream and host gaming events with other users. Discord allows users to co-operatively play games and stream videos. Instagram and Snapchat allow you to live-stream, and Snapchat does so with a reduced capacity. Twitter offers no way to live-stream or host an event.

Posting of Events	1	0.5	0.5	0.5	0.5	Facebook allows users to create event posts and pages to which users can RSVP and comment, whilst the other platforms only allow you to share and post about events.
Multi-platform Compatibility	1	1	1	1	1	
Security Features	1	1	1	1	1	
Privacy Options	1	1	1	1	1	
Profile Creation	2	2	2	2	2	
Personalised Unique Profile	1	1	1	1	1	
Depersonalised Anonymous Profile	1	1	1	1	1	
Post Features	10.5	10	5.5	7.5	10	The model of the platform behind the social media platforms had an impact on this feature.
Following of Users	1	1	1	1	1	
Liking of Posts	1	1	0	0	1	

Download of Posts	0.5	0.5	0.5	0.5	0.5	All platforms allow you to download your own posts, however, you can't download other users' posts without using an external tool.
Easiness of Posting	1	1	1	1	1	
Engage with Posts	1	1	0.5	1	1	Snapchat does not allow users to interact with posts as much as other platforms.
Hashtags	1	1	1	0	1	Discord does not implement hashtags in posts
Uploading or Posting of Different Content	1	1	0.5	1	1	
Multimedia Posts	1	1	0.5	1	1	
Sharing of Posts	1	1	0.5	1	1	
Comments	1	1	0.5	1	1	
Reactions	1	0.5	1	1	0.5	Twitter and Instagram do not allow much except liking a post. Whilst you can react to stories on Instagram, as these are not the main form of posting, they were not considered as important as the main post in the evaluation.
Types of Posts	1	1	0.5	1	1	
Usability	5.5	6	6	5	6	
Convenience	1	1	1	1	1	

Seamless Interaction	0.5	1	1	1	1	Facebook mobile page redirects you to Facebook Messenger to private message users.
Minimal Barriers	1	1	1	1	1	Contingent on the user having an account on the platform.
Ease of Use	1	1	1	0.5	1	Bolstered by the fact that some questionnaire participants stated that Discord is less accessible, and they found it harder to use.
User Friendly Interface	1	1	1	1	1	
Familiarity	1	1	1	0.5	1	

Table B.1: Evaluation of social media based on features

Appendix C

Participant Information Sheet for Questionnaire

Page **1** of **3**

Participant Information Sheet

Project title:	Students' experience with using social media for a sense of belonging in higher education during the COVID-19 pandemic
Principal investigator (PI):	Cristina Alexandru
Researcher:	Paula Sparrow Muñoz
PI contact details:	cristina.alexandru@ed.ac.uk

This study was certified according to the Informatics Research Ethics Process, reference number 153386. Please take time to read the following information carefully. You should keep this page for your records.

Who are the researchers?

Cristina Alexandru, Principal Investigator. Paula Sparrow Muñoz

What is the purpose of the study?

The purpose of this study is to analyse how social media has impacted student's sense of belonging in higher education during the COVID-19 pandemic. The purpose of this questionnaire is to obtain information about the use of social media for social interaction, to draw some basic information about its usage in higher education and some basic information about students' sense of belonging in higher education through the pandemic.

Why have I been asked to take part?

You are a student in higher education that has been affected for at least an academic year by COVID-19 pandemic, that is, if you were in higher education at any point during 2019-2022.

Do I have to take part?

No – participation in this study is entirely up to you. You can withdraw from the study at any time. Please note any data anonymised or aggregated with other data and results of analysis prior to any request for withdrawal will be maintained as the data anonymisation and processing procedure cannot be reversed. Your rights will not be affected. If you wish to withdraw, contact the PI. We will keep copies of your original consent, and of your withdrawal request.

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What will happen if I decide to take part?

You will be sent a link to an MS Forms questionnaire via email with questions about your age, year of study, social media usage and the influence of social media in your life during the pandemic. The questionnaire should take less than 10 minutes to complete and will only need to be filled in once.

Are there any risks associated with taking part?

There are no significant risks associated with participation.

Are there any benefits associated with taking part?

No, however, your participation in this study will allow for an in-depth review of the applications of social media to help with sense of belonging in higher education, and this could help design better social media platforms.

What will happen to the results of this study?

The results of this study may be summarised in published articles, reports and presentations. Quotes or key findings will be anonymized: We will remove any information that could, in our assessment, allow anyone to identify you. With your consent, information can also be used for future research. Your data may be archived for a maximum of 2 years. All potentially identifiable data will be deleted within this timeframe if it has not already been deleted as part of anonymization.

Data protection and confidentiality.

Your data will be processed in accordance with Data Protection Law. All information collected about you will be kept strictly confidential. Your data will be referred to by a unique participant number rather than by name and/or e-mail. Your data will only be viewed by the research team stated above.

All electronic data will be stored on a password-protected encrypted computer and on the University's secure encrypted cloud storage services (Sharepoint) and all paper records will be stored in a locked filing cabinet in the PI's office. Your consent information will be kept separately from your responses in order to minimise risk.

What are my data protection rights?

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Who can I contact?

If you have any further questions about the study, please contact the lead researcher, Paula Sparrow Muñoz, s2036366@ed.ac.uk.

If you wish to make a complaint about the study, please contact

inf-ethics@inf.ed.ac.uk. When you contact us, please provide the study title and detail the nature of your complaint.

Updated information.

If the research project changes in any way, an updated Participant Information Sheet will be emailed to you by Paula.

Alternative formats.

To request this document in an alternative format, such as large print or on coloured paper, please contact s2036366@ed.ac.uk.

General information.

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Appendix D

Participants' consent form

Participants were asked at the beginning of the questionnaire if they agreed with the information outlined in the questionnaire. If they disagreed, they would not be allowed to complete the questionnaire.

Participant number:_____

Participant Consent Form

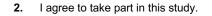| Project title:	Students' experience with using social media for a sense of belonging in higher education during the COVID-19 pandemic
Principal investigator (PI):	Cristina Alexandru
Researcher:	Paula Sparrow Muñoz
PI contact details:	cristina.alexandru@ed.ac.uk

By participating in the study you agree that: I have read and understood the Participant Information Sheet for the above study, that I have had the opportunity to ask questions, and that any questions I had were answered to my satisfaction.
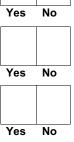
- My participation is voluntary, and that I can withdraw at any time without giving a reason. Withdrawing will not affect any of my rights.

- I consent to my anonymised data being used in academic publications and presentations.

- I understand that my anonymised data will be stored for the duration outlined in the Participant Information Sheet.

- I consent to the researcher taking notes throughout the study.

- I consent to being audio recorder during the study. The purpose of this recording is to obtain specific references

Please tick yes or no for each of these statements.

1. I allow my data to be used in future ethically approved research.

Yes	**No**

2. I agree to take part in this study.

Yes	**No**

3. I consent to being audio recorded.

Yes	**No**

Name of person giving consent   Date   Signature

_____   _____   _____

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Participant number:_____

_____ _____ _____
Name of person taking consent Date Signature

_____ _____ _____

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Appendix E

Systematic Review Theme Structure

This is a structure of Themes and Sub-themes in the systematic review analysis.

- ⌄ ◯ Features of Social media
  - ⌄ ◯ Ability to Message
    - ◯ Comment features
    - ◯ Emojis
    - ◯ Messaging Platform
    - ⌄ ◯ Multimedia Messages
      - ◯ GIFs
      - ◯ Images
      - ◯ Instant Messages
      - ◯ Memes
      - ◯ Text
      - ◯ Video Calls
      - ◯ Videos
      - ◯ Voice Notes
    - ◯ Negative
    - ◯ Neutral
    - ◯ Positive
    - ◯ Private Messages
    - ◯ Public Messages
    - ◯ Sharing Resources
  - ⌄ ◯ Accessibility
    - ◯ Negative
    - ◯ Neutral
    - ◯ Positive
  - ⌄ ◯ Aesthetic
    - ◯ Clean format
    - ◯ Clean Presentation
    - ◯ Negative
    - ◯ Neutral
    - ◯ Positive
  - ⌄ ◯ Alerts
    - ◯ Negative
    - ◯ Neutral
    - ◯ Notification
    - ◯ Positive
  - ⌄ ◯ Availability
    - ◯ Negative
    - ◯ Neutral
    - ◯ Positive
    - ◯ Widely Available
  - ⌄ ◯ Community
    - ◯ Contacts
    - ◯ Followers
    - ◯ Friends
    - ◯ Groups
    - ⌄ ◯ Moderation
      - ◯ Negative
      - ◯ Neutral
      - ◯ Positive
    - ◯ Negative
    - ◯ Networks
    - ◯ Neutral
    - ◯ Positive
  - ⌄ ◯ Cost
    - ◯ Free
    - ◯ Negative
    - ◯ Neutral
    - ◯ Positive
    - ◯ Premium

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- ⌄ ○ Post Features
  - ○ Ability to Follow
  - ○ Ability to Like Posts
  - ○ Download
  - ○ Easeness of posting
  - ○ Engage with Posts
  - ○ Hashtags
  - ○ Multimedia Posts
  - ○ Negative
  - ○ Neutral
  - ○ Positive
  - ○ Postage of Content
  - ○ Respond to Posts
  - ○ Send
  - ○ Sharing of Posts
  - ⌄ ○ Types of Posts
    - ○ Audio
    - ○ Digital Flyers
    - ○ Games
    - ○ GIFs
    - ○ Images
    - ○ Link Pages
    - ○ Live Streaming
    - ○ Memes
    - ○ Negative
    - ○ Neutral
    - ○ Polls
    - ○ Positive
    - ○ Text
    - ○ Thread
    - ○ Tweets
    - ○ Videos

- ⌄ ○ Events
  - ○ Negative
  - ○ Neutral
  - ○ Online Events
  - ○ Positive
- ⌄ ○ Platform Compatability
  - ○ Mobile App
  - ○ Negative
  - ○ Neutral
  - ○ Positive
  - ⌄ ○ Types of Platforms
    - ○ Mobile App
    - ○ Website

- Privacy
  - Negative
  - Neutral
  - Positive
  - Privacy Options
- Profiles
  - Anonymous Profie
  - Channel
  - Followers
  - Negative
  - Neutral
  - Page
  - Positive
  - Unique Personal Profile
- Security
  - Login
  - Negative
  - Neutral
  - Positive
- Servers
  - Group
  - Negative
  - Neutral
  - Positive
  - Private Group

- Usability
  - Convenient
  - Ease of Use
  - Familiarity
  - Flexibility
  - Minimal Barriers
  - Negative
  - Neutral
  - Positive
  - Seamless Interaction
  - Simple
  - User Friendly
- Usage of Social Media
  - Building of Communities
    - Moderation
  - Collaboration
  - Communication
    - Advertising
  - Dangerous Use
  - Education
  - Engagement
  - Event Hosting
  - In Person Organisation
  - Posts
  - Self-Presentation
  - Sharing
  - Tracking - Monitoring

Appendix F

User Studies Theme Structure

This is a structure of Themes and Sub-themes in the user studies analysis.

- Experience
  - Negative Experience
  - Neutral Experience
  - Positive Experience
- Features of social media
  - Accessibility
    - Negative
    - Neutral
    - Positive
  - Community
    - Channels
    - Community Feeling
    - Group
    - Negative
    - Neutral
    - Positive
  - Events
    - Hosting Events
    - Negative
    - Neutral
    - Positive
    - Posting of Events
  - Post Features
    - Comments
    - Multimedia Post
    - Negative
    - Neutral
    - Positive
    - Reaction
    - Sharing

- Types of Posts
  - Calls
  - Images
  - Livestreams
  - Memes
  - Posts
  - Stories
  - Videos
  - Upload of posts
- Profiles
  - Depersonalised Profile
  - Negative
  - Neutral
  - Positive
  - Unique Personal Profile
- Servers
  - Channels
  - Customisable Server
  - Group
  - Negative
  - Neutral
  - Positive
  - Usability
- Higher Education Usage
  - Fellow Students
  - Personal usage
  - Societies and Clubs
  - University or Cohort

- ⌄ ◯ Usage
  - ◯ Asking for help
  - ◯ Avoidance of Loneliness
  - ◯ Building of Community
  - ◯ Communication
  - ◯ Conduct to Videogame
  - ◯ Connecting with People
  - ◯ Creating Impressions
  - ◯ Creation of Specific Servers
  - ◯ Developing of Culture
  - ◯ Engagement
  - ◯ Events
  - ◯ Learning
  - ◯ Meeting People
  - ◯ Misuse of Social MEdia
  - ◯ Obtain Updates
  - ◯ Posting of Content
  - ◯ Sharing
  - ◯ Staying in Contact
  - ◯ Tracking or Monitoring
  - ◯ University Course Contribution
  - ◯ Usage to Procrastinate
  - ◯ Watching Videos or Livestreams

Appendix G

Questionnaire Questions

This chapter of the appendix shows the questions participants were given in the questionnaire. As stated, the questionnaire was hosted on Microsoft Forms.

Student's Experience with Social media for a sense of belonging during COVID-19 ⸬

Please take a couple of minutes to read the information outlined in this consent form: https://uoe-my.sharepoint.com/:w:/g/personal/s2036366_ed_ac_uk/EYQoSAnYvAtCkOWczs3fy7cBxRtxCvoO4zW5lh-a8LRyVw?e=xUbXVU

* Required

1. Please select if you agree to ALL of the below statements:
   - I have read and understood the Participant Information Sheet for the above study, that I have had the opportunity to ask questions, and that any questions I had were answered to my satisfaction.
   - My participation is voluntary, and that I can withdraw at any time without giving a reason. Withdrawing will not affect any of my rights.
   - I consent to my anonymised data being used in academic publications and presentations.
   - I understand that my anonymised data will be stored for the duration outlined in the Participant Information Sheet.
   - I allow my data to be used in future ethically approved research.
   - I agree to take part in this study.
   *

   ○ Yes

   ○ No

2. What academic year are you currently in? *

   ○ First Year

   ○ Second Year

   ○ Third year

   ○ Fourth year

   ○ Fifth year

   ○ Doing a PhD or Masters

   ○ Graduated

3. During how many university academic years were you affected by the COVID-19 pandemic? *

○ 1 year

○ 2 years

○ 3 years

4. How many hours a week during the pandemic did you spend on social media? *

○ None, I do not use social media

○ Less than 5

○ 5-10

○ 10-15

○ 15-20

○ 20-25

○ More than 25

5. What social media platforms did you use during the pandemic? Select all the options that apply. *

☐ Facebook

☐ Instagram

☐ Snapchat

☐ Twitter

☐ Discord

☐ TikTok

☐ Other

6. What do you use social media for primarily? Select all the options that apply. *

☐ Keeping in touch with friends and family

☐ Filling spare time

☐ Reading news stories

☐ Finding content

☐ Shopping inspiration

☐ Sharing and discussing opinions with others

☐ Making new contacts

☐ Other

7. Please express your level of agreement with the following statements: *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Your social media usage increased during the pandemic.	○	○	○	○	○
Social media has a positive impact on your life.	○	○	○	○	○
The COVID-19 pandemic affected your sense of belonging to your university and school.	○	○	○	○	○
Social media has helped you maintain a sense of belonging during the COVID-19 pandemic.	○	○	○	○	○
Social media helps you create a sense of belonging during the COVID-19 pandemic.	○	○	○	○	○

8. Which social media platform helped you the most in creating or maintaining a sense of belonging to your university and school during the pandemic? *

○ Facebook

○ Instagram

○ Snapchat

○ Twitter

○ Discord

○ TikTok

○ I am not sure

○ Other

9. Why? Describe your experience with it. *

10. Which social media platform helped you the least in creating or maintaining a sense of belonging to your university and school during the pandemic? *

○ Facebook

○ Instagram

○ Snapchat

○ Twitter

○ Discord

○ TikTok

○ I am not sure

○ Other

11. Why? Describe your experience with it. *

12. Do you have any other comments about your social media use during the pandemic to add?

Appendix H

Systematic Review Table of Studies

Data	Information
Date	19/12/23
Keywords	"social media" + ("design recommendations" OR "design guidelines" OR "feature guidelines" OR "feature recommendations") + "COVID-19" + "higher education"
Language	English
Time frame	2020-2023
Records identified after the first sweep	924
Records screened and assessed for eligibility	924
Studies included in the analysis	24

Table H.1: Data on the studies from the systematic review.

Appendix I

Systematic Review Papers

Paper	Author	Date
Application and Feasibility of various Teaching Tools used in Online Classes during Covid-19 in Tertiary Education	Sumie Chan	2020
Blended Learning - the New Normal at Institutions of Higher Learning: A Case Study from Singapore	Ganthi Viswanathan	2022
Collaborative online learning model for fashion design	Andreana Alba Nery de Mello Buest	2022
Designing and exploring student-led online learning environments	Hanna Celina Teyssandier	2020
USAGE OF DIGITAL TOOLS AND SOCIAL MEDIA FOR COOPERATIVE AND COLLABORATIVE LEARNING	Sosniuk Oleh, Ostapenko Iryna and Klymenko Iryn	2020
INFOGRAPHICS HELPING TEACHERS DURING EMERGENCY REMOTE TEACHING	Jana Čepičková, Pavel Mentlík, Lucie Rohlíková, Jana Vejvodová	2020
EFFECTIVE USE OF SOCIAL MEDIA NETWORKS FOR COLLABORATIVE LEARNING IN HIGHER EDUCATION	Lakmali Jayarathna	2022
Enhancing maritime education through online distance learning in developing environments	Margaret Balungile Masuku	2020
Examining the effect of learning environment on student behaviour through comparison of face-to-face and online design studio	Ceren DOĞAN DERVİŞOĞLU, Ebru YILMAZ	2023
Handbook for Online Learning Contexts: Digital, Mobile and Open: OER and the Future of Digital Textbooks	Athanasia Kotsiou and Tyler Shores	2021

Handbook for Online Learning Contexts: Digital, Mobile and Open: Formulated Professional Identity of Learning Designers and the Role of Open Education in Maintaining that Identity	Keith Heggart	2021
Handbook for Online Learning Contexts: Digital, Mobile and Open: Outdoor Learning with Apps in Danish Open Education	Theresa Schilhab and Gertrud Lynge Esbensen	2021
Handbook for Online Learning Contexts: Digital, Mobile and Open: Implementing Open Pedagogy in Higher Education: Examples and Recommendations	Evrim Baran, Dana Al Zoubi, and Boris Jovanović	2021
Learning by design: enhancing the digital literacy of adult learners in a blended learning environment	Zenobia Alethea Angelica Davidse	2020
Left to their own devices: An investigation of learner perceptions of smartphones as tools of language learning	Martin Mullen	2021
Optimal Video Length Effect on Flow Experience and Perceived Learning: A Repeated Measure Experimental Design with Randomization	Ömer Demir, Bengi Birgili	2023
Motivation in Gamified Social Media Learning: A Psychological Need Perspective	Kingsley Ofosu-Ampong, Richard Boateng, Emmanuel A. Kolog, and Thomas Anning-Dorson	2021
Unlocking the Potential of Game-Based Learning for Soft Skills Development: A Comprehensive Review	Tan Bee Sian, Chong Kim Soon	2023
Transition from Physical Design Studio to Emergency Virtual Design Studio. Available Teaching and Learning Methods and Tools—A Case Study	Elżbieta Komarzyńska-Świeściak, Britt Adams and Laura Thomas	2021
Twelve tips for rapidly migrating to online learning during the COVID-19 pandemic	John Sandars, Raquel Correia, Mary Dankbaar, Peter de Jong, Poh Sun Goh, Inga Hege, Ken Masters, So-Young Oh, Rakesh Patel, Kalyani Premkumar, Alexandra Webb, Martin Pusic	2020
Teaching and Learning During COVID-19: Perceptions of Students, Parents, and Teachers in Egypt	Mohamed Mahgoub and Eleanore Hargreaves	2021
Notes from the Portal: Feminist Educational Practices in Post-Pandemic Art and Design Classrooms	Amy Bagshaw	2021
A Global Ethics and Values Framework for Remote Learning During Crisis	Mahrous Muhammad Basuny, Zakaryya Abdel-Hady, and Ismail Fayed	2021

Teaching Civics/History and English to Adult Lawful Permanent Residents with Limited English Proficiency at Local Libraries: Challenges and Practices During the COVID-19 Pandemic	Ally Zhou, Miriah Ralston, and Rebecca Barker	2021
Best Practices for Building Faculty Presence and Student Engagement	Iram Tanvir	2021
Creating a Global Virtual Tandem Community Through Technology and Experiential Learning	Robert J. McClung and Michael David Barr	2021
COVID-19: An Opportunity to Deindustrialize Writing Education	Amir Kalan	2021
Developing Social Media Literacies Through Online Social Reading Practices	Osman Solmaz	2021
An Innovative Learning Management Approach for improving learning practices in Australian University Context	Harpreet Singh	2021
Personal Learning Analytics Application for Students	Andharini Dwi Cahyani	2023
Open educational resources and open pedagogy in Lebanon and South Africa	Jako Olivier, Fawzi Baroud	2023
Guidelines for the Development of Open Educational Resources at a Higher Education Institution through the Lens of Domestication	Siphamandla Mncube, Maureen Tanner, Wallace Chigona, Mpine Makoe	2023
INFORMATION NEEDS OF INTERNATIONAL STUDENTS: THE CASE OF THE FEDERAL UNIVERSITY OF MINAS GERAIS	DANIELLE DO CARMO PIMENTA RIOGA	2022
LEVELING THE LEARNING CURVE	WILLIAM B. EIMICKE, SOULAYMANE KACHANI, AND ADAM STEPAN	2023

Table I.1: Papers obtained from the systematic review.

Additionally, the Excel table containing all the data items is hosted on SharePoint, which can be accessed through the following link: Data Points