



# College of education students' attitude towards the use of online information dissemination tools for counseling in Ghana

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## ABSTRACT

Online counseling is widely regarded as a cost-effective and convenient means to provide basic counseling services, and it is increasingly being used in university treatment. However, it is unclear what amount of information and attitude students have about online counseling in colleges of education. This study looked at students' views toward and likelihood of using online counseling towards help information seeking and dissemination to see if it has the potential to increase overall service consumption. A survey was conducted and responded to by 411 students from two Ghanaian colleges of education and based on the Theory of Planned Behaviour, students' attitudes and intentions to use online counseling were investigated. The paucity of online counseling systems in the colleges of education is shown in the study, yet 94% of participants said they would use online counseling services if given the opportunity. Based on these findings, it is recommended that providing online counseling in parallel to face-to-face counseling could be an effective strategy for counseling units in colleges of education to boost service delivery and so better serve their students.

## 1. Introduction

Counseling services that are provided to students have the double responsibility of assisting troubled students while also providing input within schools and colleges [1]. For many students, higher education can be stressful because it often entails multiple significant impact on the living conditions and lifestyles, as well as tackling difficult responsibilities such as profession selection, relocation, and academic obligations [2]. Many potential stressors exist throughout the tertiary school years, such as housing circumstances and financial concerns, and for many students, this is their first time away from home, making adjusting to a new social situation even more challenging [3].

It is commonly established that learners who are having higher levels of mental disorders or distress have a higher chance of underachievement and abandoning school [4]. Stress experiences due to educational demands and pressure to achieve are common among students [5,6]. These psychosocial distresses have been demonstrated to have a major impact on students' academic and personal lives, affecting persons from lower socioeconomic status in particular [7]. As a result, they are a major source of concern for educational systems all around the world [8,9]. The role of student counseling centers in schools cannot be overstated, as they are shown to give a distinct variety of support for young people dealing with these difficulties [10,11]. There are many educational institutions that have established counseling services globally to provide support to students [12].

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Counseling services in schools have been found to assist students retain their value continuously, with implications for their psychological and academic issues [13,14]. Dependence on technology is currently transforming information seeking, dissemination as well as communication and the use of advanced technologies on a worldwide scale [15]. Online social information sharing and learning, for example, have surpassed face-to-face interactions. Technology improvements have also elicited knowledge transmission among virtual and face-to-face psychological practice [16]. In today's world, technology has blended with the conception of therapy, resulting in the delivery of psychotherapy or counseling through the Internet. Counselors can use the internet to deliver services, and young people have the potential to embrace or employ them to their benefit [17]. The concept of online counseling is progressively making its way into treatment, and the recent epidemic of COVID-19, which was preceded by uncertainty and anxieties of physical contact, marked a contemplation of online counseling's entire approval, in addition to face-to-face counseling [18].

Over the last 10 years, application of online counseling has grown, and it now extends out now to counselors by providing the opportunity to provide various online support systems for therapy by functioning as a purposeful constructive online interpersonal communication system [19]. In the delivery of online counseling services, social media, Internet-based, and interactive information dissemination methods have been shown to be effective and significant [20]. A number of studies have shown that online counseling is effective and offers a number of benefits, including easy information service provision, providing counseling from any place at any time, reducing transportation barriers, and inexpensive costs [21–23]. Because of the intrinsic characteristics of online counseling and the lack of presence in a social and face-to-face setting, clients are more likely to make self-assured statements of facts, which helps the online counseling process [24].

Crucial for this study stem from the fact that several previous research have found that the period of life spent at higher education are critical for aspects of individuals' mental health [25]. Specifically, it is common for students to continuously report higher rates of depression as compared to persons who are not schooling [26–29]. Despite the fact that tertiary students consume a lot of Internet information and prefer to communicate online over in-person, little is known about their propensity to engage counsellors online [30]. This follows the present trend in Ghana, where young people are found to be very technologically inclined, well-versed on the Internet and social networking sites, and share information more effectively online but not with their counselors [31].

When there is a lack of training and professional growth, people's perceptions of internet counseling are often skewed negatively. Communication breakdown, ambiguity, and misinterpretation due to the usage of shorter sentences and emoticons is a legitimate concern in online counseling [32]. A language barrier between school counselors and students, in particular, is predicted to be a barrier to online counseling [33]. As a result, the outcome of this study is likely to provide important insight for future counseling service supply as well as implementation efforts in Ghana's tertiary education. Thus, the aim of the study is to look into the perceptions and intentions of College of Education students in help information seeking and dissemination through the use of online counseling in Ghana. The study's aim is achieved by ascertaining students help information seeking through these objectives:

- RO1: finding out online counseling tools and systems available to students
- RO2: ascertaining students' motivation and intention to access online counseling

## 2. Literature review

### 2.1. Conceptualising online counseling

The Internet's growth has resulted in substantial changes in human life, allowing for the merging of the Internet and counseling services, called online counseling [34]. Online counseling is the delivery of counseling services over the internet, cellphone, teleconferencing, and email rather than in a face-to-face environment. Because people used to exclusively receive face-to-face counseling from a counselor, it is a fresh notion that is gaining popularity with time. Online counseling, as asserted by Ref. [35], concerns the deliberate exchange of information aimed at resolving a difficulty that the individual has brought to the counselor's attention. Messaging, phone call, chat, email, and video conferencing are all options for delivering this type of counseling [36].

As opined by Ref. [37], online counseling is the use of computer-mediated communication technologies by a professional counselor to deliver psychotherapy in cyber world [38]. The counselor and the counselee are in different locations and converse through the Internet via these channels [39]. Online counseling can be a reliable tool that provides useful information to both counselors and people seeking counseling services [40]. Nonetheless, the availability and quality of the Internet, as well as access to technology, are critical to the success of online counseling deployment.

There are two basic ways to connect with individuals through online counseling: asynchronous communication and synchronous communication [41]. E-mail, chat boards, and weblogs are examples of asynchronous formats in which the counselor and the patient do not communicate instantly. Textual discourse or "real-time" discussions, in which both the counselor and the client utilize a computer to communicate concurrently, such as instant messaging and video conferencing, are examples of synchronous contacts [42]. Aside from the synchronous and asynchronous modes of online counseling, a variety of programs have been developed to assist in online counseling [43].

### 2.2. Counseling services in educational institutions

Various researchers have discovered that tertiary education students had significant rates of anxiety, depression and suicide risk [27,44–48]. Students have been discovered to have the ability to face personal and relationship issues that may have an indirect impact on their academic achievements. These difficulties frequently halt or terminate their academic progress. Furthermore, psychological

difficulties might have a negative impact on students' social integration and academic engagement. To address these issues, educational institutions have established counseling centers.

Counseling centers provide students with a safe and familiar environment in which they can conquer the situational, intrapersonal, and interpersonal obstacles that often prohibit them from seeking psychological help. Students and employees can receive counseling at these centers to help them deal with psychological and social issues. While these counseling services are frequently used to address ongoing challenges that impact a distraught academic performance of students, they are also used as a foremost intervention for students with stable psychotic symptoms, enabling them to access psychotherapeutic interventions or services on mental health [49]. Psychotherapeutic and neurobiological therapies delivered by school counseling services have been demonstrated to effectively reduce psychological distress among pupils [50]. According to Rückert (2015), counseling services for students in Europe feature different approaches with psychodynamic and humanistic approaches been the most common [51].

Although students are accustomed with face-to-face or in-person counseling services, research among tertiary students suggests that they have a favorable attitude of online counseling [52]. Wong et al. (2018) discovered that a large proportion of students want to use online counseling for their academic and behavioral requirements [53]. Similar research has shown that using social media to provide online counseling can assist kids get psychosocial support in schools [20,31].

In Ghana, tertiary students are fond of social media and other online communication tools, yet research show that online counseling is underutilized in academic schools. According to Amos et al. (2020), the limited use of online counseling at Ghanaian colleges is due to the authorities' rejection of this style of counseling [18]. School authorities, in particular, have yet to put in place official structures to accommodate online counseling in schools, and the Ghana Psychological Council, which is responsible for regulating counseling activities in Ghana under the Health Professions Regulatory Bodies Act, 2013 (Act 857), has still yet to establish laws, standards, and legislation to govern the practice of online counseling.

### 2.3. Online counseling versus face to face counseling

When it comes to minimizing intellectual, emotional, and mental health difficulties among college students, online counseling has been found to be equally beneficial as face-to-face counseling [54,55]. Convenience and accessibility are two major advantages of online counseling [53]. Furthermore, text-based internet counseling has the advantage of maintaining anonymity and providing a more comfortable environment for people who are uncomfortable with face-to-face encounters [56]. As a result, online counseling enables anonymity, which may reduce the impact of barriers associated with face-to-face counseling, increasing the possibility that a person may seek help [57].

While students appear to prefer face-to-face counseling, those with higher self-stigma, prejudice from close friends, and worse communication skills have been found to prefer online counseling [58]. Students with more serious psychological challenges, such as depression and anxiety, were also shown to be more ready to seek online counseling than those with less serious conditions [59]. As a result, if students have a more accessible form of communication that they feel they can use more easily or in a more comfortable manner, they may be more ready to seek assistance [60].

Although internet counseling seems to be effective for a number of people, some research findings demonstrate that it is not always the best option. For example, counseling has been found to be negligible in online contexts with counselors finding difficulty in steering interactions, as well as a reduced ability to elicit answers from clients within online sessions [61]. Traditional face-to-face counseling is preferred and comfortable by most counselors [62]. According to studies, counselors appear to have a negative opinion of online therapy [63–65].

### 2.4. Ethical issues and disadvantages of online counseling

The most significant problem for online counseling is the lack of nonverbal cues such as facial expressions and gestures [66]. Importantly, a lack of physical presence in human communication may reduce the psychotherapy relationship's feeling of intimacy, trustworthiness, and engagement. Text-based online communication appears austere and chilly because it appears more official with a lack of supporting and compassionate tone during online counseling. As a result, in text-based online counseling, some phrases may be misunderstood and come across as harsher than expected, leading to misinterpretation [67].

Clients and counselors must have access to technology as well as the essential skills to fully utilize the Internet for online counseling. There are also ethical and legal issues to consider while providing online counseling. Attacks to confidentiality might emerge both during and after the counseling session [68]. For example, storing records of online counseling sessions by either the counselor or the client may raise concerns about confidentiality [69]. Again, asynchronous online counseling may not be the greatest choice for a client emergency because the counselor's reaction may arrive too late to be of any assistance [70].

## 3. Theoretical framework

The theoretical foundation for this study was the Theory of Planned Behavior (TPB). In the literature on help-seeking, the TPB is the most extensively used and studied theory [71]. It has been used in a variety of research to investigate psychological health help-seeking intentions as well as other cognitive help-seeking intentions, such as online counseling intentions [72]. Based on the theory's subjective norm, it established that attitudes, hypothesis, perceived behavioral control or influence intentions, and they are the best predictors of conduct [73].

This study, which was guided by the TPB (Fig. 1) looked into the perceptions and intentions of College of Education students

regarding the use of online counseling. The goal of this study is to discover the characteristics that influence students' decision to seek online therapy. According to Ref. [74], intention maintains a behavioral disposition until the perfect time and opportunity present itself, therefore effort is required to turn this desire into action.

## 4. Methodology

### 4.1. Study design

The study employed the survey design which involves the identification of a specific group of people (in this case the students) to collect information from some of them in order to gain insight from them [75,76]. Through the use of quantitative research approach and positivist research paradigm, the study looked into the phenomenon.

### 4.2. Participants

A cross-sectional online survey was developed to assess students' perceptions, and intentions to utilize online counseling services. The population of the study included all Level 200 and 300 students from two Colleges of Education: The Kibi Presbyterian College of Education (KPCE) and the Abetifi Presbyterian College of Education (APCE). The Level 400 students were out of the College for their internships while the Level 100 students were new to the environment and may not have grasped the use of the technology and the services if available in the College, thus, the reason for their exclusion in the study. The study employed convenience sampling, thus, the Level 200 and 400 students who were available and willing to take part in the study responded to the survey. The survey was completed and returned by 411 students and a total of 196 (47%) of the participants were from KPCE and 215 (53%) were from APCE. The participants consisted of 204 (49.6%) males and 207 (50.4%) females.

### 4.3. Material and procedure

A questionnaire was employed for data collection for this study. After reading and signing the informed consent form, participants completed the online survey. The survey contained three sections: demographics, available counseling tools and systems for students, and students' motivation and intention to use online counseling. On their separate campuses, participants completed the questionnaire in their computer laboratories and on their smartphones. Participants were urged to invite friends and other peers to fill out the survey so that a larger sample could be obtained at a cheap cost. It took about 10 min to complete the survey.

The Index of Consistency was used to validate the content validity of the survey. In order to assess the internal consistency of constructs and measure the degree to which the variables were connected to one another, Cronbach's alpha was used and the latent variables' reliability was found to be 0.874.

### 4.4. Measures

The study's guidance and theoretical base was the theory of planned behavior. Based on the three primary features of the theory: subjective norms, behavior, and attitude, the study looked into students' intentions to use online counseling services. Participants were asked to use a 5-point Likert scale to indicate how likely they would use online counseling services, based on the theory's 'Subjective norms' attribute. Participants were asked if they had ever utilised online counseling services or tools, and this was matched to their TPB-based 'help-seeking behavior.' The use of a direct measure or attitude of being comfortable or uncomfortable with online counseling was sufficient for the goal of the study in regard to 'attitudes toward help-seeking.'

### 4.5. Analysis

The study employed descriptive statistics to process the quantitative data. The data derived from the survey were edited, categorized and entered into the SPSS statistical software (Statistical Package for Social Scientists) to generate summary frequency tables [77].

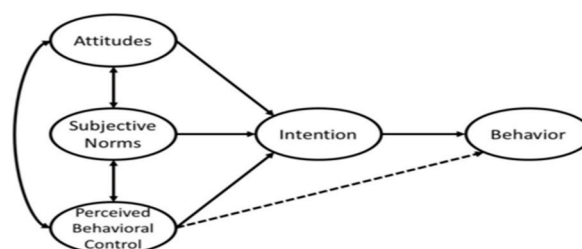


Fig. 1. Theory of planned behaviour model (Ajzen, 2005).

## 5. Results

### RO1: finding out online counseling tools and systems available to students

#### 5.1. Awareness of online counseling

Awareness of online counseling services is crucial to their utilization. Thus, the study sought to ascertain if the students were aware of online counseling services. As depicted in Fig. 2, majority of the students who participated in the survey 324 (79%) were aware and did have knowledge on online counseling. This shows a high awareness rate on online counseling among the surveyed students. However, while 93% of the participants from APCE were aware of online counseling, 37% of the participants from KPCE had no knowledge of online counseling services.

#### 5.2. Online counseling systems in school

For online counseling to be possible, there has to be a system in place to help with its effective implementation and for such, the surveyed students were asked to indicate whether or not there is an existence of an online counseling system in their respective schools. The responses are presented on Table 1.

Reading from Table 1, the analysed data shows that 29% of the surveyed students were able to access counseling services online in their schools. Nevertheless, majority of the respondents (71%) were not able to highlight availability of online counseling systems in their respective colleges.

### RO2: ascertaining students' motivation and intention to access online counseling

The application of the Theory of Planned Behavior enabled the study to examine students' intention and motivation to utilize online counseling services. The TPB's three elements of intention, behaviour and attitude were used to measure students' intention to utilize online counseling.

#### 5.3. Help-seeking behaviour

The behavioural measure based on the TPB examined whether or not the participants had ever utilised online counseling and the rate of utilizing online counseling services when provided the option. The participants were asked to indicate if they had ever engaged in help-seeking behaviour online (from friends, relatives or professional counsellors). The analysed data clearly shows that almost all the respondents (91%) had utilised online counseling (Table 2).

Furthermore, in order to ascertain the perceptions of the students with regards to online counseling, the study enquired to see if they would utilize online counseling when presented with the option. Overwhelmingly, 94% of the students highlighted their willingness to utilize online counseling services when provided (Table 3).

#### 5.4. Subjective norms

The Subjective norms' attribute of the theory was employed to guide the measurement on how likely participants would utilize online counseling services. Descriptive statistics for self-reported intentions to utilize online counseling services when faced with academic, relationship or psychological challenges were employed (Table 4). The analysed data point to the fact that participants were

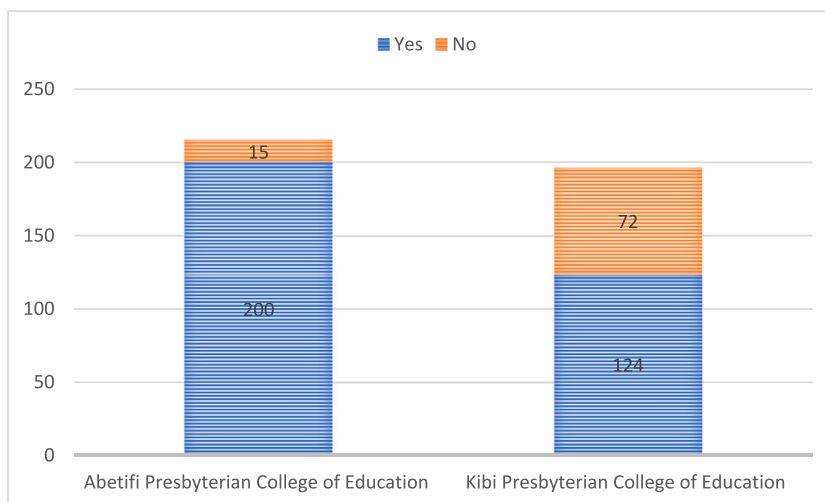


Fig. 2. Awareness of online counseling.

**Table 1**  
Online counseling systems in school.

Institution	Yes	No	Not sure	Total
KPCE	72 (36.7%)	87 (44.4%)	37 (18.9%)	<b>196</b>
APCE	46 (21.4%)	106 (49.3%)	63 (29.3%)	<b>215</b>
<b>Total</b>	<b>118 (28.7%)</b>	<b>193 (47%)</b>	<b>100 (24.3%)</b>	<b>411</b>

**Table 2**  
The use of online counseling.

Institution	No	Yes	Total
Abetifi Presbyterian College of Education	16 (7%)	199 (93%)	<b>215</b>
Kibi Presbyterian College of Education	22 (11%)	174 (89%)	<b>196</b>
<b>Total</b>	<b>38 (9%)</b>	<b>373 (91%)</b>	<b>411</b>

**Table 3**  
Probable use of Online Counseling.

Institution	No	Yes	Total
Abetifi Presbyterian College of Education	13 (6%)	202 (94%)	<b>215</b>
Kibi Presbyterian College of Education	11 (6%)	185 (94%)	<b>196</b>
<b>Total</b>	<b>24 (6%)</b>	<b>387 (94%)</b>	<b>411</b>

significantly more likely (59%) to utilize online counseling when faced with academic challenges. Interestingly, 86% and 61% of the students were significantly less likely to utilize online counseling when faced with relationship and psychological challenges.

### 5.5. Attitudes toward help-seeking

Attitude plays an important role in seeking or counseling as it is the level to which a person holds favorable or unfavourable views on a specific behaviour [73]. The use of direct measure of been comfortable or uncomfortable with online counseling was employed to examine participants' attitudes toward online counseling (Table 5). As depicted on Table 4, majority of the participants (60%) expressed their desire to utilize online counseling via the use of social media platforms. The analysed data also shows that the participants would not be comfortable to access counseling through the use of online video call. It is evident from the analysed data that most of the participants would prefer the use of text messages (51%) to engage counsellors online as compared to audio (37%) and video calls (19%). Moreover, while the results of the study depict that majority of the participants would not be comfortable to utilize online counseling on issues affecting their relationships (85%) and mental health (69%), most of the participants (64%) indicated that they would be comfortable to access online counseling on issues affecting their academics.

## 6. Discussion

The study examined perceptions and intentions of College of Education students in utilizing online counseling in Ghana towards help information seeking and dissemination. The online counseling is different from the traditional face-to-face counseling because it is a new kind of service that has shown up due to the growth of technology and its adoption in rapid spread of information rapidly [78]. It is important to highlight that the main purpose of counseling is "to help people to manage their problems in living more effectively; to develop unused or not sufficiently used opportunities more fully and to contribute them to become better at helping themselves in their everyday lives" [79].

In Ghana, internet counseling ideas and practices are not part of the counselor training curriculum [18]. It was also discovered that educational institutions in Ghana have yet to formally approve and implement an online counseling system due to a lack of support from authorities, administrators, professionals, and human service organisations. This could explain why none of the colleges surveyed had online counseling services. The majority of participants stated that their colleges do not offer online counseling services. The application of the behaviour attribute of the TPB enabled the study ascertain whether students have utilised online counseling. Although this study confirms lack of online counseling systems in the surveyed schools, the results from the study show that

**Table 4**  
Likelihood to access online counseling.

	Extremely likely	Likely	Neutral	Unlikely	Extremely unlikely	Total
Academic	114 (28%)	127 (31%)	87 (21%)	63 (15%)	20 (5%)	<b>411</b>
Relationship	37 (9%)	19 (5%)	148 (36%)	95 (23%)	112 (27%)	<b>411</b>
Psychological	83 (20%)	79 (19%)	150 (37%)	42 (10%)	57 (14%)	<b>411</b>

**Table 5**  
Attitude towards online counseling.

	Comfortable	Neutral	Uncomfortable	Total
Online counseling via social media	248 (60%)	97 (24%)	66 (16%)	411
Online counseling via text	209 (51%)	82 (20%)	120 (29%)	411
Online counseling via audio call	151 (37%)	76 (19%)	184 (20%)	411
Online counseling via video call	78 (19%)	67 (16%)	266 (65%)	411
Online counseling on academics	263 (64%)	65 (16%)	83 (20%)	411
Online counseling on relationship	63 (15%)	154 (38%)	194 (47%)	411
Online counseling on mental health	128 (31%)	106 (26%)	177 (43%)	411

participants were aware and had utilised online counseling in diverse ways. As found earlier through the use of TPB, behavior in this case had the foundation on the students' belief approach that formed their intentions and encouraged them to utilize online counseling [80].

This finding backs up Tannous (2017)'s empirical study, which found that students have an excellent understanding of online counseling [20]. Furthermore, Seechaliao and Rungrueng (2016) discovered that undergraduate students regard social media as one of the finest communication platforms for seeking help with their psychosocial problems [81]. Previous research on intention in relation to the Theory of Planned Behavior depict that intention and behavior based are able to describe a person's intention and in relation to this study their quest to seek help through online counseling [82]. It may be assumed from this that the participants' usage of online counseling was aided by their interest and frequent use of social media, as investigations have shown that tertiary students in Ghana utilize social media on a regular basis [83–85]. More importantly, this study shows that when it comes to the use of social media, students had a very good view about online counseling. Only 16% of the participants expressed discomfort with the use of social media for online counseling.

Irrespective of the availability of sophisticated and widespread technologies that makes online counseling possible, as well as research revealing that the effectiveness of online counseling is comparable to the traditional face-to-face counseling, it may appear that counsellors and service users prefer face-to-face counseling [65]. However, tertiary students have been found to prefer online counseling as a good option for their counseling demands [86]. The outcomes of this study support the notion that tertiary students prefer online counseling because virtually all of the participants (94%) expressed a willingness to use online counseling services if given the opportunity. These findings clearly support respondents' intention to utilize online counseling based on the TPB. A study based on the TPB concludes that "Intention is an indication of how strong the individual's belief is to try a behavior, and how much effort to behave" [82]. It is however, important to establish that the findings of this study contradict Wong et al.'s (2018) conclusion that just 35% of tertiary students choose online counseling [53].

The effectiveness of internet technology in supporting and resolving mental behavioral difficulties among university students has only recently begun to emerge [87]. The usage of internet technology has grown ingrained in tertiary students' lives, leading them to assume that online counseling is the way to go because it is already a part of their daily routine [20]. University students in Ghana had a favorable attitude toward online counseling, according to Awabil and Akosah's (2018) study [31]. Overall, the outcomes of this study support the notion that Ghanaian students have a favorable attitude toward counseling. Although, the findings of this study is consistent with earlier studies that found a generally positive attitude towards online counseling [52,62], it goes on to say that when it comes to academics, students are more likely to be favorable about online counseling than when it comes to interpersonal and psychological issues. Furthermore, participants prefer to communicate with online counselors using text messaging rather than audio or video calls.

## 7. Conclusion and recommendations

Due to a lack of formal laws, attention, and resources, Ghana appears to have a poor understanding of internet counseling. As a result, it is understudied in the country's educational institutions. The study examined into the perceptions and attitudes of College of Education students concerning the use of online counseling. Due to the psychosocial obstacles that students confront, counseling services are critical to their academic achievement. It's a planned, private dialogue that starts with one person's want to reflect on and address a problem in their lives, and another person's readiness to help [88].

The findings of this study show that students have a positive attitude about online counseling, despite the fact that online counseling systems are not available in their colleges. In particular, the study finds that students in colleges of education have a visual grasp of the usage of online counseling and would be eager to use it if given the opportunity. Nonetheless, the students expressed dissatisfaction with online counseling when it came to specific difficulties and parts of their lives. In terms of specific sentiments, the survey discovered that students have a negative opinion toward online counseling. Students, for example, were hesitant to seek help from online therapists for concerns harming their relationships and mental health. Again, the students expressed discomfort in the use of audio and video calls for online counseling.

Furthermore, the findings of the study show that online counseling services are ripe for introduction at colleges of education because students are familiar with them and eager to use them. The study suggests that online therapy be introduced to supplement traditional face-to-face counseling, because a mix of online and traditional face-to-face counseling would increase capacity in the beginning. It is also critical for school counseling units to educate students about the benefits of online counseling in order to lessen students' negative attitudes toward it.

## 8. Implication for policy and practice

Due to their hectic schedules, tertiary students may have scheduling challenges that prevent them from participating in traditional face-to-face counseling. Because it aims to provide excellent counseling services for students, this study has significant implications for tertiary education in Ghana. The goal of the study is to learn about students' perspectives and attitudes in order to figure out how to best use technology in counseling to provide more effective psychosocial support to students.

The study's findings emphasize the potential for online counseling to be appealing to students. As a result, policymakers and stakeholders have an opportunity to look into how online counseling might be integrated into college programs. Students in Ghana are undoubtedly familiar with technology devices such as smart phones and the use of social media to seek assistance. As a result, it's critical to look into how to include social media into online counseling growth. Another finding of this study is the necessity to use a hybrid strategy in the early stages of adoption, using online counseling as a supplement to face-to-face counseling to build capacity for both students and counsellors.

### Author contribution statement

Philip Kwaku Kankam: Conceived and designed the study; Performed the experiments; Analysed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Bernard Kofi Adinkrah: Conceived and designed the study; Analysed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

### Data availability statement

Data will be made available on request.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2023.e18833>.

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