Online Education and its Impact on Students' Emotional Well-Being: The Mediating Role of Social Interaction

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Abstract

In an era marked by virtual classrooms and digital learning platforms, the influence of online education on students' emotional well-being emerges as a crucial discussion point. As students navigate screens rather than traditional classrooms, understanding the nuanced impact of this shift on their emotional health becomes paramount. This study aimed to examine how online education impacts students' emotional well-being, considering social interaction as a mediating factor. A quantitative research design was employed, targeting students enrolled in online programs at Allama Iqbal Open University (AIOU). A sample of 2,000 students was taken from four different faculties and programs through stratified random sampling. The data were collected using a self-developed tool with three scales and a total of 28 items. The data were analyzed through SPSS and AMOS. In the results, the study found a significant direct association between online education and students' emotional well-being (β = 60.52%). In addition, the study also found a significant indirect association between online education and students' emotional well-being through the mediating role of social interaction (β = 39.48%). In conclusion, students who were getting online education had concerns about their emotional well-being due to the long screen time. No social interaction due to online learning also significantly contributed to increasing issues about emotional well-being among students.

Keywords: Online education, emotional well-being, mental health, education, teacher

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Introduction

Over the last few years, the sector of education has experienced an unprecedented shift introduced by the extensive implementation of digital technologies with online education being at the forefront of such changes (Johnson et al., 2023; Chakraborty et al., 2021; Lockee, 2021). This transition to online learning has resulted in making changes in the way students gain access to the learning material, communicate with the instructor, and access and experience the academic content unprecedented (Selvaraj et al., 2021; Erlangga, 2022). Online education is flexible, convenient, and accessible, but there is a developing crisis regarding its possible effects on how students think about their mental health (Putri & Sari, 2021; Mishra et al., 2020).

The issue of the linkage between digital education and mental health is a complicated and multidimensional question (Sakellari et al., 2021). On the one hand, online learning environments allow students to learn independently at a pace of their own and in any place, minimizing the

obstacles due to traditional classroom learning (Nimavat et al., 2021). The latter convenience has been especially helpful to those whose learning requirements are more varied, those with physical restrictions or time limitations (Maqsood et al., 2021; 2021; Lockee, 2021). Nonetheless, the online variants of education have their risks as well, the movement to the new form of education has its own challenges that may adversely impact the mental and emotional health of students (Farooq et al., 2020). Among these concerns is the fact that online learning experiences lead to the loss of social isolation (Kuo, 2014). Online education usually requires minimum interpersonal communication and few chances of spontaneous interaction, as compared to traditional classrooms whereby, students interact face-to-face with their fellows and instructors, on a daily basis (McCrory et al., 2008). This social isolation may result in isolation, loneliness, and disconnection, which is considered a risk factor, including mental health difficulties in the form of depression and anxiety (Pandit & Agrawal, 2022).

Furthermore, digital technologies dependency applied in online studying can enhance the total amount of screen time and digital fatigue in learners (Salimi et al., 2023). The direct health issue induced by long time on screens is physical health; eye strain, headaches, and sleep dysfunction have all been related to excess screen time and may, consequently, affect emotional well-being laterally (Laar et al., 2021; Abdullah et al., 2023). Moreover, the hectic and thus challenging experience of online coursework might increase the stress level and a sense of academic pressure, especially when online learners try to follow new learning platforms or they combine several online courses at the same time (Mäkelz et al., 2020). Moreover, online education can become a problem to those students who work better on a physical curriculum (Pandit & Agrawal, 2022). Online learning entails the independence and self-regulation that may intimidate others and result in a lack of self-worth or feelings of inferiority (Friedman, 2020). All this can also add to academic and personal uncertainty and affect the overall mental health of students (Chen et al., 2020).

Considering such concerns, it is obligatory to analyze critically the effects of digital education on the emotional well-being of students and define the means to achieve positive emotional health outcomes in online learning conditions. As one of the key online education providers, the AIOU should take this issue into consideration to understand how emotional well-being should not be jeopardized in the move towards online learning environment, but rather integrated critically and relevantly into the learning experience of students all over the world. The current study is also relevant to the research that Investigates how the emotional well-being in the educational setting is changing and what impacts it has in an ever more digitized society. In order to accomplish the research goals stated above the following research objectives were achieved:

- To explore the connection between online education and social interaction.
- To identify relationship, if any, between social interaction and emotional well-being.
- To ascertain relationship between online education and students' emotional well-being.
- To investigate a mediating role of social interaction in relationship between online education and students' emotional well-being.

Literature Review

Online education

Online education is a digital tool that allows learning beyond the four walls of conventional classrooms; in addition, it has multiple approaches and practices (Hoi et al., 2021). Online education is becoming a common aspect of teaching, with learners using synchronous communication and interacting with the educator in real-time with the use of online classrooms

and video conferencing programs as well as means of live chats (Utomo et al., 2021). The synchronous training reflects the organization model of conventional face-to-face classrooms giving the participants the opportunity to interact, discuss and get a live response to their work (Means et al., 2014). On the contrary, asynchronous learning provides more flexibility to the student with the pre-recorded lectures, discussion boards and assignments, which can be executed at convenience to the students (Bach et al., 2006). Conversely, blended learning tries to suit different timings and student cultures by giving them permission to use the course materials whenever they wish to and at their convenience. Blended learning brings digital, face-to-face, and tool online and offline into a hybrid learning environment (Tayebinik & Puteh, 2013). Other options involve adaptive learning which uses algorithms to customize learning to their ability and preference and the experiential learning that takes advantage of the simulation, virtual labs and interactive multimedia to promote engagement and recall (Abdullah et al., 2024; Hockly, 2018).

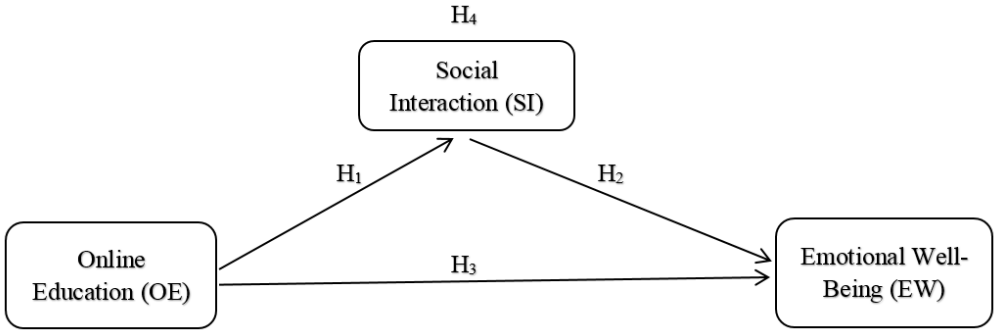
Emotional well-being

Emotional well-being is a form of emotional, psychological, and socially healthy state, which is related to feeling happy and satisfied with life, being strong in the course of its challenges (Langeland, 2022; Clabaugh et al., 2021). It includes such aspects as the possibility to deal with stress, positively interacting with others, being able to adapt to changes and failures (Yang & Ma, 2020). Emotional well-being is considered more as the whole, not the lack of mental illness but more of how the emotional experiences and cognitive processes are carried out (Ripp et al., 2020). An individual with healthy mental health is bound to have a good perspective on life, have a sense of contentment and achievement and enjoy a healthy work-life balance (Kohls et al., 2021). The variables contributing to emotional well-being are their social support systems, their ability to cope with situations and develop effective coping mechanisms, self-esteem, and purpose and belonging (Fingerman et al., 2021). But emotional well-being is subject to a plethora of internal and external variables, including inheritable predispositions, life events, socio-economic levels, and availability of resources and things such as mental health care (Clabaugh et al., 2021). Improvement of emotional well-being entails creating an inclusive and supportive environment that promotes openness and removes the stigma of mental health problems, and offers the tools and opportunity of receiving suitable care and resources (Kliziene et al., 2021). The key point is to make emotional well-being one of the focus areas of general health and understand its influence on resilience, productivity, and quality of life (Clabaugh et al., 2021).

Students' on-campus social interaction

The social interactions held on campus are an essential part of the general undergraduate experience and help students advance and develop themselves personally (Hamdan et al., 2021). It involves such face-to-face interactions as those with peers, faculty or staff and the campus at large (Ferguson, 2010). Such interactions also create chances when students are allowed to establish important relationships, acquire relationship skills as well as a feeling of belonging and connection to the university setting (Li & Yang, 2021). Social life on campus in terms of clubs, student organizations, sports teams and cultural activities among others provide avenues through which students can meet and pursue any new interests and even personalize with new passion and share with others the experiences in cooperating and leading groups (Fassinger, 1995). Moreover, the casual communication, which is possible in the shared settings such as cafeteria, study lounge, and residence halls, promotes the sense of belonging and comradeship among students. The social interaction helps in the emotional well-being of students as they become less isolated and lonely because of the demands of school life (Salta et al., 2022). Besides, campus-based social life complements academic achievements through the strengthening of the peer-entered support system, coursework assignment collaborations, and availing desirable sources and mentorship opportunities (Fraser et al., 2010).

Figure 1. *Conceptual Framework.*



Hypotheses

H_1: There is a notable connection between online learning and social interaction.
H_2: There is a significant association between social interaction and emotional well-being.
H_3: There is a significant association between online learning and emotional well-being.
H_4: Social interaction serves as a mediator in the connection between online education and emotional well-being.

Research Design

Research Design and Participants

A quantitative method was utilized in this study, incorporating a cross-sectional survey design. The total population of the study comprised all students enrolled at Allama Iqbal Open University (AIOU) in Islamabad. AIOU is considered one of Pakistan's largest institutions, providing online education from secondary school to PhD programs. As of 2023, AIOU boasts a substantial total enrolment of 1,027,000 students (AIOU, 2023). Further details regarding the breakdown of students by faculty and program can be seen in Table 1.

Table 1. *Population Distribution.*

Faculties	*Up to Bachelor	M.A	M.Phil.	Ph.D.	Total
AIS	166,231	62,215	10,098	2,588	241,132
Edu	146,237	37,755	9,649	1,583	195,224
NS	276,586	84,232	14,831	4,473	380,122
SSH	138,856	58,323	11,361	1,982	210,522
Total	727,910	242,525	45,939	10,626	1027000

Note. *Up to bachelor education consisted (secondary school certificate (9 and 10 grade), higher secondary school certificate (11 and 12 grade), and bachelor of arts (B.A 13 and 14 grade).

Sampling

Stratified random sampling method was employed to select a sample of 2000 students for this study. This approach was chosen because the university population was categorized into distinct groups based on faculties and programs. At the time of the study, Allama Iqbal Open University (AIOU) comprised four faculties: Arabic and Islamic Studies (AIS), Education (Edu), Natural Sciences (NS), and Social Sciences and Humanities (SSH). The sample was selected in proportion to the size of each faculty and program within the university. The researcher collaborated with the university's admissions branch to obtain lists of all enrolled students, including their respective faculties and programs. Students receiving any form of on-campus, face-to-face education were excluded from the sampling pool. Subsequently, the researcher

implemented a systematic sampling technique to select the sample from each faculty and program. Using a table of random numbers, the researcher identified specific students by considering the last four digits of the random number table. Table 2 presents the distribution of the selected sample across various faculties and programs.

Table 2. *Sample Distribution.*

Faculties	Up to Bachelor	M.A	M.Phil.	Ph.D.	Total
AIS	330 (24%)	123 (26%)	21 (25%)	6 (25%)	480 (24%)
Edu	281 (19%)	74 (15%)	13 (18%)	2 (14%)	370 (18%)
NS	543 (39%)	165 (34%)	25 (33%)	7 (41%)	740 (37%)
SSH	266 (18%)	118 (25%)	21 (24%)	5 (20%)	410 (21%)
Total	1420 (70%)	480 (23%)	80 (6%)	20 (2%)	2000

Measures

A Google Form questionnaire was developed for data collection in this study, incorporating three scales: Online Education (OL), Social Interaction (SI), and Emotional Well-Being (EW). The OE scale, serving as the independent variable, consisted of eight items. The Emotional Well-being (EW) scale, used as the dependent variable, included 10 items. Similarly, the Social Interaction (SI) scale, functioning as the mediating variable, also consisted of 10 items. All scales employed a 5-point Likert format ranging from 1 (strongly disagree) to 5 (strongly agree), with a total of 28 items across all instruments. To confirm the validity of the scales, assessments of face, content, and construct validity were conducted. The scales were reviewed by a team of six experienced professors experienced in the world of online education, and as a result of their recommendations, the necessary changes were made to improve them. Additional construct validity was conducted after data collection. Convergent and discriminant validity as well as confirmatory factor analysis (CFA) were conducted to build a measurement model. In the pilot testing process, the questionnaire was administered to 200 students (10 percent of the sample population) and 173 complete responses were obtained. Pilot testing was also a very important step to evaluate the feasibility and clarity of the instrument used in the study. The feedback given led to some changes to clarify and remove biases. Also, internal reliability was determined by evaluating it through Cronbach's alpha and composite reliability (CR) internal validity. Internal consistency was assessed using Cronbach's alpha with items maintaining a coefficient of 0.70 or higher. Confirmatory factor analysis (CFA) was also used to generate CR to strengthen the internal consistency and reliability of the scales.

Procedure of data collection

The initial step in data collection involved obtaining approval from university authorities, who were informed about the research objectives and assured of adherence to ethical standards throughout the data gathering process. Afterward, 2000 Google Form surveys were also sent to target students through email, accompanied by an informed consent form outlining the study's purpose and including guidelines on voluntary participation, anonymity, and confidentiality. The 33 days allowed as survey completion period sent an impressive 88 percent of respondents filling in their surveys with 1,779 forms coming in. A total of 14 questionnaires with high level of missing data were detected after careful assessment and were consequently eliminated in data analysis process so as to maintain validity and reliability of the study finding.

Procedure of data analysis

To process the raw-data, SPSS, version-22 and AMOS software were applied after the concerned task of data-collection had already ended. To start with, Principal Component Analysis

(PCA) has been applied in Exploratory Factor Analysis (EFA) in order to diminish the dimension of data-set, converting a great number of variables to a more controllable group of variables. The second procedure was Confirmatory Factor Analysis (CFA) to create an assessment model, which was done by analyzing construct validity and reliability. Hypothesis testing was also carried out using structural Equation Modeling (SEM), through which, mediated models were estimated, as well as the total, direct and indirect effects.

Findings

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy for the dataset is very high at 0.941, indicating that the data are highly suitable for conducting factor analysis. Additionally, Bartlett's Test of Sphericity yielded a highly significant result (Approx. Chi-Square = 20098.315, df = 378, Sig. = 0.000), indicating that correlations between variables in the dataset are sufficiently large for factor analysis to be appropriate.

Table 3 presents a set of goodness of fit measures for three distinct constructs. Each construct is evaluated using key statistical indicators commonly employed in structural equation modeling. All the CMIN/DF values (EW = 1.310, SI = 1.383, SI, and OE = 1.168) fall within the cut-off criteria between 1 and 3. The Comparative Fit Index (CFI) measures the model's fit against a baseline model, with higher values closer to 1 indicating better fit.

Table 3. *Goodness of Fit.*

	CMIN	DF	CMIN/DF	CFI	SRMR	RMSEA	PClose
Emotional Well-being (EW)	495.47	378	1.310	0.981	0.062	0.049	0.041
Social Interaction (SI)	522.83	378	1.383	0.959	0.078	0.055	0.022
Online Education (OE)	439.19	378	1.168	0.968	0.068	0.051	0.037

Note. The fit indices were evaluated based on the cut-off criteria recommended by Hu and Bentler (1999).

The Standardized Root Mean Square Residual (SRMR) quantifies the average discrepancy between observed and model-implied correlations, with lower values indicating better fit. The Root Mean Square Error of Approximation (RMSEA) assesses the model's approximation error per degrees of freedom, with all values closer to 0.05 or less considered acceptable. In addition, the PClose evaluate the significance of the RMSEA, with all values greater than 0.01 generally indicating good fit.

The statistics of discriminant and convergent validity through the Fornell-Larcker criterion are shown in Table 4. All the Average Variance Extracted (AVE) values, which measure the amount of variance captured by the construct relative to measurement error, are lower than the CR values (see Table 6), indicating good convergent validity. All the Mean Shared Variance (MSV) values (0.384 for EW, 0.589 for SI, 0.588 for OE) are lower than the AVE values, supporting discriminant validity. Additionally, all Maximum Shared Variance MaxR(H) values are close to 1, suggesting that each construct shares more variance with its indicators than with other constructs in the model.

Table 4. *Discriminant Validity through Fornell-Larcker Criterian.*

	AVE	MSV	MaxR(H)	EW	SI	OE
EW	0.832	0.384	0.989	0.912		
SI	0.766	0.589	0.980	0.607***	0.881	
OE	0.821	0.588	0.979	0.620***	0.761***	0.911

Note. *** $p < 0.001$.

Table 5 displays the grouped psychometric characteristics and discriminant validity measures of the constructs, assessed using the Heterotrait-Monotrait (HTMT) ratio. The CR values are high for all constructs (0.980 for EW, 0.969 for SI, 0.973 for OE), indicating the internal consistency and reliability of the measurement model. Similarly, all the Cronbach's Alpha (α) values are also greater than .70, indicating high reliability of the constructs.

Table 5. *Psychometric Properties and Discriminant Validity Using the HTMT Approach.*

	CR	α	M	SD	EW	SI	OE
EW	0.980	0.789700	4.089750	1.02157			
SI	0.969	0.771500	4.057500	1.09511	0.463		
OE	0.973	0.798875	4.075313	1.11641	0.579	0.541	

In terms of discriminant validity assessed by the HTMT criterion, all the values displayed below the diagonal represent the ratio of the correlations between different constructs to the correlations within the same construct. All off-diagonal HTMT values are below the recommended threshold of 0.85, confirming satisfactory discriminant validity among the constructs.

Table 6. *Psychometric Properties of Scales (N = 1779).*

Factor 1: Online Education (OE)		**M**	**SD**	**FL**	**α**
OE5.	Delivering recorded video lectures for asynchronous learning	4.0075	0.89131	0.823	0.795
OE8.	Creating interactive multimedia materials and contents	4.0275	0.90487	0.816	0.781
OE1.	Implementing live classes via video conferencing technology	4.1250	0.98834	0.803	0.807
OE6.	Conducting quizzes, tests, assignments using online platforms	4.1375	0.98540	0.799	0.817
OE7.	Establishing virtual discussion forums for collaborative learning	4.1200	1.02627	0.798	0.825
OE2.	Distributing electronic textbooks, articles, and digital learning resources	4.1100	1.02250	0.796	0.814
OE4.	Facilitating virtual laboratory experiences for hands-on learning	4.0825	0.93963	0.741	0.790
OE3.	Integrating educational apps and mobile learning tools	3.9925	0.94322	0.719	0.762
Factor 2: Social Interaction (SI)		**M**	**SD**	**FL**	**α**
SI4.	Limited interaction with classmates during academic tasks.	4.0225	0.89386	0.827	0.790
SI5.	Lack of direct, in-person interaction with teachers during lectures.	3.9875	0.93516	0.809	0.793
SI8.	No engagement in collaborative work with peers in small groups.	3.9850	0.96286	0.807	0.789
SI7.	Non-engagement in extracurricular activities.	4.0750	1.04504	0.792	0.774

SI3.	Little socializing with peers during recess and other downtime.	4.0600	0.98937	0.785	0.815
SI1.	No participation in social events and festivals.	4.0375	0.99427	0.778	0.789
SI10.	Limited involvement in community service and volunteer activities.	4.0850	0.99259	0.763	0.706
SI9.	Absence of participation in peer support networks.	4.0750	1.05221	0.763	0.701
SI6.	Limited exposure to students from different grade.	4.0900	0.96136	0.748	0.797
SI2.	Non-participation in multicultural events and exchange programs.	4.1575	1.04902	0.743	0.761
Factor 3: Emotional Well-being (EW)		**M**	**SD**	**FL**	**α**
EW1.	Feeling loneliness and social isolation in online learning.	4.0400	0.96992	0.895	0.805
EW6.	Eye strain due to excessive screen time.	4.0550	0.97948	0.890	0.798
EW2.	Headaches due to excessive screen time.	4.0400	0.96214	0.889	0.772
EW8.	Digital fatigue due to excessive screen time.	4.0750	0.96004	0.882	0.792
EW10.	Feelings of apathy due to excessive screen time.	4.0300	0.99829	0.867	0.779
EW4.	Disinterest due to lack of teacher and students motivation.	4.0325	0.94003	0.859	0.800
EW5.	Academic frustration due to excessive screen time.	4.1600	1.02324	0.831	0.788
EW9.	Negative physical health due to sitting in front of screens.	4.1475	1.05524	0.831	0.799
EW7.	Lack of sense of community increases feelings of alienation.	4.1700	1.02162	0.829	0.789
EW3.	Academic anxiety due to changes in learning formats.	4.1475	1.03121	0.827	0.775

Table 7 presents estimates from a mediation model in which the pathway from Online Education (OE) to Social Interaction (SI) shows a significant positive relationship ($\beta = 0.7881$, $p < .001$), suggesting that OE has a substantial positive effect on SI. Similarly, the pathways from OE to Emotional Well-being (EW) ($\beta = 0.4463$, $p < .001$) and from SI to EW ($\beta = 0.3698$, $p < .001$) also indicate positive effects.

Table 7. *Path Coefficient. (Direct Effects)*

Dependent Variable	Independent Variable	β	S.E	t	Bootstrap LBCI	Bootstrap UBCI
SI	OE	0.7881***	0.042	18.720	0.6721	0.9137
EW	OE	0.4463***	0.076	5.860	0.2424	0.6651
EW	SI	0.3698***	0.074	4.958	0.1912	0.6170

Note. *** $p < .001$. Bootstrapping was set at 3,000 samples.

All the t-values are greater than ±3.00, indicating precision and significance of these estimates. The Bootstrap Lower and Upper Bound Confidence Intervals (LBCI and UBCI) further confirm the reliability of the estimates. Bootstrapping, conducted with 3,000 samples, was used to assess the robustness and significance of these mediation effects.

Figure 2. *Structural Model.*

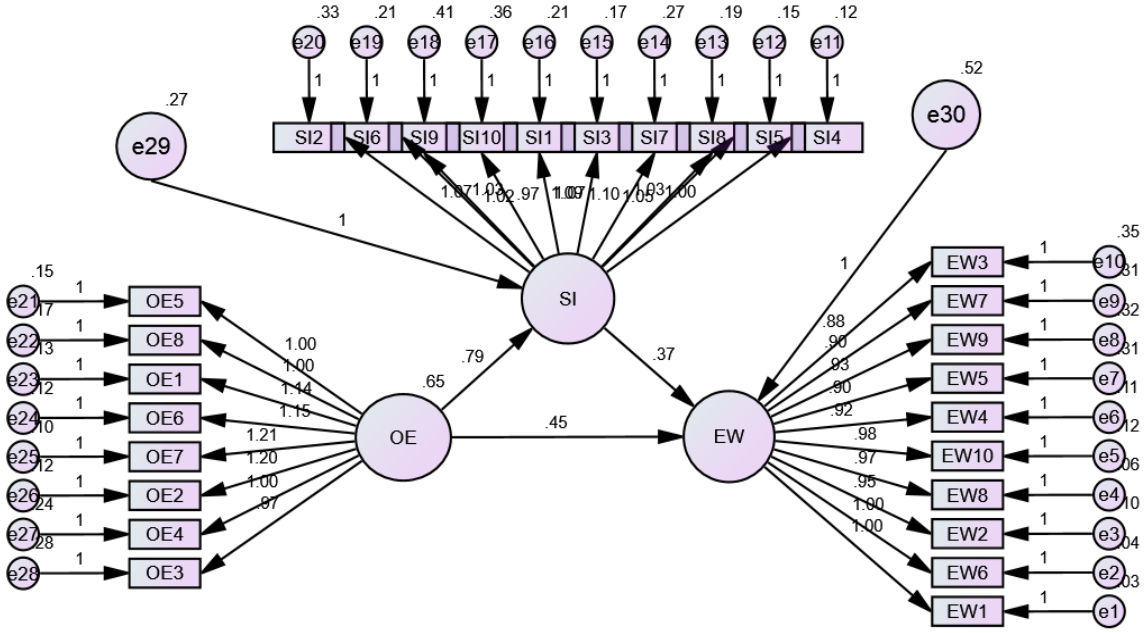


Table 8 presents the total, direct, and indirect effects of Online Education (OE) on Emotional Well-being (EW) in a mediation model. The Total effect (β = 0.7381, p = 0.009) is significant, representing the overall impact of OE on EW, combining both direct and indirect pathways. The Direct effect is also significant at (β = 0.4467, p = 0.005), which specifically captures the direct influence of OE on EW, independent of the mediating variable (Social Interaction, SI). The Indirect effect is (β = 0.2914, p = 0.007), indicating a significant mediated impact of OE on EW through its influence on SI.

Table 8. *Total, Direct, and Indirect Effects of OE on EW.*

	Effect	S.E	Bootstrap LBCI	Bootstrap UBCI	p	Relative Effect Size
Total	0.7381	0.081	0.5587	0.8813	0.009	---
Direct	0.4467	0.112	0.2420	0.6652	0.005	60.52%
Indirect	0.2914	0.089	0.1394	0.4889	0.007	39.48%

Note. Bootstrapping was set at 3,000 samples.

The Standard Error (S.E) and Bootstrap Confidence Intervals (LBCI and UBCI) provide information on the precision and reliability of these effect estimates. The relative effect sizes highlight the proportions of the total effect that are attributed to direct (60.52%) versus indirect (39.48%) pathways. Overall, these findings suggest that while Online Education has a significant direct impact on Emotional Well-being, a substantial portion of its effect is also mediated through its influence on Social Interaction, underscoring the importance of both direct and indirect pathways in explaining the relationship between these constructs.

Discussion and Recommendations

Discussion

The research revealed that there exists a strong correlation between online learning and social interaction that there is a subtle interaction between online learning platforms and social interaction. Although online learning is conventionally viewed as being alien to social interaction because it is virtual, it clearly promotes a number of socializing features. This interaction may be in form of discussion boards, group work, or even video conferences. It is via these mediums that students discuss and share ideas, get to know each other as well as instructors to augment the process of learning not just through the intake of content. The same findings are similar to Means et al. (2014) who have found that the relationship between online education and social interaction points at the potential that digital spaces have to foster meaningful interpersonal relationships, and community in the virtual classroom, and transform the traditional understanding of learning spaces.

The study has also highlighted that there is a significant influence of social interaction on the mental health of a person. Humans are by nature social animals and our capacity to communicate and build our relationships is a central aspect of our emotional state. Supporting, validating, and expressing emotions are also opportunities presented by meaningful social interactions with friends, family, or members of the wider social networks. Such intertwines lead to a sense of belonging, self-esteem, and self-realization, and eventually increase emotional resilience and well-being. In line with these data, Hamdan et al. (2021) explained that the absence of social connection might result in the development of feelings of isolation, loneliness, and distress, which means that social interaction is a vital factor of psychological balance.

The research identified an important connection between online learning and well-being that illuminated the complex effect of online educational platforms on emotional well-being of the individuals. Although online learning has been touted as a very accessible and flexible kind of learning, the effect it has on the emotional strength is a rather unexplored field. Nonetheless, the results implied that conducting online education could potentially hold positive connotations in emotional well-being. Online learning can help reduce the pressure on the traditional learning environment and enable the learner to make the learning environment meet their needs and desires. Besides, the feeling of independence and control that can be offered by online studying conditions might also add to the matter of competence and mastery, which positively influence the self-esteem and general emotional fulfilment. The conclusions of Fingerman et al. (2021) amounted to the positive effect of online education on social interaction and support networks that could be achieved with the help of a virtual community and collaborative activities and the feeling of connection and belongingness associated with it that was conducive to emotional well-being.

Moreover, the study has also revealed a mediating effect of social interaction in the association between online education and emotional well-being that provided a detailed perspective on the processes involved when online learning influences the emotional well-being of people. It implies that online education has a simple contribution to emotional well-being but it has a substantially important intermediate process and point in this connection which is a presence of a social interaction. By using virtual-reality based communication channels, collegial work, and discussion groups that are built into the online learning environment, members in a network participate in authentic social interaction and develop the sense of connectedness, support, and belongingness. According to Fraser et al., social interactions are one of the factors leading to better emotional well-being since they provide a chance to express emotions, adornment, and support. In addition to that, the social experience in the context of online

education can counteract potential feelings of isolation and loneliness as caused by solitary learning experiences, alleviating the possibility of poor emotional results.

Conclusion and recommendations

The conclusion of this paper emphasizes a strong interdependency in the relationship between online education, socialization, and emotional health, which boils down to some blend interactions each having unique effects on the lives of online learners. Through the findings, it has been established that online education can act as an agent that helps nurture social interaction that has traditionally been an attribute of learning in isolation by opening up avenues where individuals are able to engage together and to interact with each other. Moreover, the considerable correlation between interpersonal communication and emotional health evidences the crucial role of interpersonal relationship in defining the mental health outcome of individuals. Notably, the research also has traced a direct correlation between online education and emotional well-being indicating that the positive outcomes of digital learning are not only based on academic achievements but also promoted to include the well-being of the human being as one. Interestingly, the mediating effect of social interaction in the correlation between online education and emotional well-being explains the mediating process whereby virtual interactions can lead to emotional hardiness and psychologically balancing.

Based on the wide range of the results of this research, it is possible to propose several recommendations to commence the digital learning environment and increase student well-being. To start with, it is of importance that teachers and curriculum developers consider the inclusion of interactive elements and collaborative tasks to online learning sites. The strategy will actually facilitate the development of enlightening social communication among the students. Consider integrating discussion boards, group work and other types of online teamwork with the aim of promoting interaction among students and the feeling of community spirit. Also, it is important to train teachers on how to make inclusive and supportive online classes. Second, training teachers to develop inclusive and supportive learning environments online would also be effective so that the latter could facilitate meaningful communication and feelings of belonging among learners. Third, educational establishments and policymakers must know about various benefits of online learning and invest in those initiatives that will see to it that both the academic and emotional well-being increases. These investments can consist of building technological infrastructure, faculty professional development, and the psychological support of participating students in online education.

Implications

Coming to the implications of this study, its findings can be significant in terms of creation, delivery, and maintenance of online education programs. To begin with, it is important that educators and curriculum designers to understand the connection between online learning, social interaction and emotional well-being. They ought to target responsive and participatory virtual learning environments. This could suggest that curriculum designs might be required to be restructured to provide increasing learning experiences that are of collaborative nature with technology being exploited to make contact with one another instantaneously and person to person. The schools and policymakers must also commit to an investment and program through which cognitive accomplishments and emotional health are supported in the digital dimension of learning. Massive professional work and support of teachers to navigate through the complexity of online teaching and developing a culture of care and support among students are the primary measures to enhance under the results of digital learning. Finally, the school needs to invest in the commitment of developing mental health resources and support services specifically designed to address the unique concerns of online learning students to enable the access of resources to promote emotional health and strength.

Future research guidelines

This study was conducted exclusively among students of Allama Iqbal Open University, which operates in a unique distance learning environment. As such, the findings may not be fully generalizable to students in conventional face-to-face institutions or other online education contexts with different instructional models, support systems, or student demographics. Future research involving a more diverse sample from multiple institutions would help validate and extend the applicability of these results. Moving forward, future studies in the domain of online learning must be able to go further into gaining some deeper insights on the particular mechanisms that social interaction brings about emotional well-being in digital classrooms. The investigation into other parameters like quality, quantity, and variations in modes of social interactions in online education platforms can give good knowledge on their different impacts on the outcome of emotional resolutions. The experience of students followed longitudinally may provide an insight into the lasting effect of online learning on emotional status and academic achievements as well. Additionally, exploring whether personality traits, learning styles etc. are influencers of how online learning, social interaction, and emotional well-being interact, is likely to provide further insights regarding the depths of the relationship between them. Additionally, research needs to be conducted on how to come up and test interventions, which have been designed to enhance the social interaction as well as emotional well-being in online educational environments.

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