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Contact frequency and quality's impact on educational integrity during deaf inclusion in higher education

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Abstract

Introduction: Academic integrity is a core issue at all higher education institutions. Repetitive qualified contact with members of a different group, such as deaf students, can result in more positive educational integrity between them and hearing peers or faculty.

Case description: This study investigated the educational integrity of deaf students, peers, and faculty influenced by their attitudes through contact frequency or quality in the inclusion process. The study sample included university undergraduate deaf students and peers, totaling 144 and 720 students, respectively, and 96 academic faculty members. Three questionnaires were used to examine the attitudes of deaf students, hearing peers, and faculty.

Discussion and evaluation: The findings revealed that the majority of deaf students, hearing students and faculty were open to the inclusion process. Frequency of contact, rather than quality of contact, significantly influenced hearing peers' and faculty members' attitudes. However, contact quality was more important than frequency of contact for positive attitudes of deaf students.

Conclusions: Both undergraduate deaf and hearing students, besides faculty, perceived gains from inclusion processes through increased cognitive, affective, and behavioral skills, implying that inclusive practices promote academic integrity behavior.

Keywords: Academic integrity, Communication, Deaf education, Higher education, Inclusion

Introduction

Ensuring equal access for learners with special educational needs, such as deaf or hard of hearing (DHH) students, in higher education universities is a global goal for sustainable development that achieves qualified education and provides fair opportunities (UN 2015). A significant number of countries around the world are actively making strides and important advancements towards achieving greater inclusivity in the realm of higher education. This progress reflects a growing commitment to ensuring that all individuals,

regardless of their backgrounds or circumstances, have access to quality educational opportunities at the university level (Lord and Stein 2018; Ismail 2018).

DHH students with unique problem-solving abilities can overcome education challenges, be employed, and succeed in future careers with the right support, necessary technology, and accessible workspaces (Gehret et al. 2021; Laabidi et al. 2014). In addition, teachers are key predictors of a successful inclusive education, where their work revolves around issues of justice between students (Kielblock and Woodcock 2023; Yuknis 2015). Negative attitudes from faculty members, along with personal barriers such as incorrect self-efficacy estimates and fear of stigmas, hinder the enrollment of DHH students in practical fields, leading to a lack of diversity (Weatherton et al. 2017; Morina and Orozco 2020).

Academic integrity aims to enhance the university's reputation by recognizing originality and honesty. To promote academic integrity, a culture of good practices should be established among students and faculty (East and Donnelly 2012). As an ethical obligation, researchers have emphasized the importance of self-advocacy, accommodation, and negotiating expectations for DHH students in education (Koutsouris et al. 2022; Batten et al. 2014; Dettman et al. 2020).

The global shift towards inclusive education, which promotes the rights of all students to be educated together, has been significant in the field of education over the past two decades, with an increasing number of DHH students attending regular classrooms (Kelman and Branco 2009). Contact with other members can lead to a more positive attitude towards the group as a whole, but requires equal status and cooperative contact (Pettigrew and Tropp 2006). Contact is the social exchange between individuals, involving interdependent actions and attempts to gain attention or communicate through linguistic and nonlinguistic means, which can be positive or negative. However, Antia et al. 2002 claimed that simply placing these students in regular classrooms does not automatically lead to meaningful social interaction or improvement in social communication skills (Antia et al. 2002). Regarding adults, institutions need to provide resources and knowledge accommodation for DHH students to ensure their success (Taylor et al. 2017; Oreshkina and Gurov 2019). Davis 2022 revealed that students from certain groups, like those with disabilities and non-native international speakers, might encounter challenges and need extra care, demanding more inclusive strategies for supporting academic integrity (Davis 2022).

Higher education institutions often include a code of honor to promote academic integrity and enforce sanctions against unethical behavior (McHaney et al. 2016). On the other hand, attitudes are psychological constructs that shape individuals' thoughts, feelings, and behaviors toward a specific topic or group of people. This positive attitude indicates achieved academic integrity or honest acts to complete the academic activity without following illegal methods and aggressive behavior. Despite a vast quantity of research concerning how to improve the interactions in DHH student's inclusive education in school, there is little literature that combines the attitudes of the key parties of learning to achieve the successful educational integrity explored by their attitudes toward the inclusion in universities. This study investigated how inclusive education promotes academic integrity behavior, as indicated by the attitudes of DHH students, hearing peers, and faculty members. The DHH student variables named 'pre-university

school type' or 'deafness reason' and the hearing peers and faculty variables, called 'experience with deaf contact' were condensed into a single practical criterion termed 'contact quality'. Moreover, 'the academic levels' of students and the 'teaching duration' of faculty are set as characteristic of the 'contact frequency'.

Literature review

The 'Theory of Planned Behaviour', developed by Icek Ajzen in 1985 as an extension of the 'Theory of Reasoned Action', seeks to predict and explain human behaviour in specific contexts. It asserts that behavior is influenced by salient beliefs and identifies three key determinants of intention: attitude towards the behavior, subjective norms, and perceived behavioral control. Attitude refers to an individual's positive or negative evaluation of their behavior. Subjective norms indicate perceived social pressure to engage in or avoid behavior. Perceived behavioral control reflects the ease or difficulty of performing a behavior influenced by past experiences and anticipated challenges. Ajzen 1991 study examined cognitive self-regulation's impact on predicting human behavior with 198 students from the University of Massachusetts at Amherst. The results indicate that intentions and perceived behavioral control can forecast behavioral outcomes, although their importance varies by context (Ajzen 1991). However, it was a different sample; many specialists refused framing the DHH through a disability justice lens and considered DHH group as those with language differences or accommodation needs.

During the past three decades, the majority of the literature available offers valuable insights into the experiences and challenges faced by deaf students in higher education. Kersting 1997 highlighted the feelings of isolation and alienation experienced by deaf students due to a lack of sign language skills and deaf cultural understanding. The study used open-ended interviews to collect data from 10 deaf college students during their orientation and their first year of college (Kersting 1997). Foster et al. 1999 emphasized the importance of providing a appropriate educational environment and comprehensive environmental support services for deaf students, including individualized education programs and qualified teachers, and the role of parents. The participants were deaf students and teachers (Foster et al. 1999).

Richardson et al. 2004 found that deafness itself does not impact academic performance or perception of academic quality. The study used the approaches to study inventory and the course experience questionnaire to collect data from 54 deaf students and 18 hearing students at two universities in the UK (Richardson et al. 2004). However, Fabich 2005 emphasized no significant predictors of academic success, suggesting a complex interplay of factors influencing achievement. The study investigated students' performance on college entrance exams and lecture comprehension with 509 deaf and hard-of-hearing participants (Fabich 2005).

Saunders 2012 highlighted the need for better support services during the transition from further education to higher education to help professionals and parents support deaf students with their applications and facilitate informed decisions regarding university choices. The study used questionnaires and a case study to collect data. The participants were deaf students from various educational institutions, including specialist colleges for the deaf, hearing-impaired units in mainstream schools, and mainstream schools and colleges in the UK. (Saunders 2012). Hitch et al. 2015 study aimed to review

the current policies and professional development activities in Australian universities to support inclusive teaching. The participants were 42 staff members from Australian universities, and the study used a desktop audit and survey to collect data. The results showed that just over one-third of Australian universities referred to inclusive teaching or Universal Design for Learning in their policies and procedures. The most frequent professional development activity was one-off workshops, which focused on accommodating specific groups of students. The study concluded that improved institutional support through policies, procedures, and professional development would enable Australian higher-education teachers to provide quality-inclusive teaching to all students (Hitch et al. 2015).

Educators' attitudes towards inclusive education are critical components of successful inclusion. Goddard and Evans 2018 showed the positive impact of pre-service training on attitudes towards inclusive education among 56 pre-service teachers from three Australian universities (Goddard and Evans 2018). Gregory and Noto 2018 developed a nine-item tool for measuring educators' three domains of attitude –cognitive, affective, and behavioral–emphasizing the importance of positive attitudes for successful inclusion at a private university in New England (Gregory and Noto 2018).

Braun et al. 2018 identified strategies to support deaf students in university STEM education, including creating welcoming environments and providing appropriate accommodation for promoting diversity and improving the quality of scientific research. The study used expert opinions and literature reviews to collect data from deaf scientists and professors who work closely with deaf students (Braun et al. 2018). Alnahdi et al. 2020 Involved 1001 students from Saudi Arabia and Egypt. The findings indicated that knowledge, contact quality, and gender significantly influenced attitudes towards people with intellectual disabilities, whereas contact frequency did not (Alnahdi et al. 2020). Wang (2020) revealed positive attitudes towards inclusive education among 299 instructors from 155 universities and colleges in Taiwan, but also identified variations based on demographics. The study used a questionnaire to examine their attitudes, and the results showed significant differences in attitudes among instructors of different genders, special education backgrounds, school types, and fields of instruction (Wang 2020).

Al-Hashimi et al. (2021) explored perceptions of inclusion for DHH students in Bahrain's art and design bachelor's degree program, highlighting the need for early intervention and specialized educator training. Eleven students and nine parents participated in semi-structured interviews and questionnaires. The results indicated that most students preferred segregation for comfort with peers and favored enrolling in a diploma program designed for them, possibly because of their inability to fully assess due to their early academic stage. Parents felt that their children lacked preparation at school and highlighted the need for early intervention and specialized educator training (Al-Hashimi et al. 2021). Kompara et al. 2021 involved 1,107 participants from Cyprus, Germany, Greece, Portugal, and Slovenia, using a survey to gauge their awareness of issues faced by deaf people and their knowledge of sign languages. The results indicated that 82% were unaware of the International Sign, while 72% thought that deaf individuals read fluently. The study emphasized the importance of addressing communication challenges, highlighting variations in sign language across countries, and interest in learning it. (Kompara et al. 2021).

Sanni-Anibire et al. (2021) focused on international students' knowledge and emotions regarding academic integrity at Canadian post-secondary institutions, highlighting the need for clear communication and indicating a gap in educating students about specific aspects of policy. The participants were 60 international students who completed a survey. (Sanni-Anibire et al. 2021). Srivastava et al. (2021) proposed a cost-effective smart learning tool that uses deep learning and computer vision techniques to support students with disabilities. The study used a sample of students with various disabilities, including hearing, speech, and visual impairments, as well as teachers. The results showed that the tool provided an effective medium of communication, enabled active participation in teaching and learning, and developed convenient two-way communication with instructors and peers (Srivastava et al. 2021). Reedy et al. (2021) highlighted the crucial role of communities of practice in promoting academic integrity at a regional Australian university. The community of practice comprised academic and professional staff with a shared interest in understanding and addressing the inconsistent application of the academic integrity policy. The study used a value creation framework to evaluate the community of practice's immediate, potential, applied, realized, and reframing values (Reedy et al. 2021).

Tuncay and Kizilaslan (2022) emphasized the need for more practical experience and training for pre-service teachers to work with students with disabilities, as well as knowledge about legislation and policies related to inclusion. Participants were 406 pre-service teachers from different departments of a university school of education in Turkey. The 'sentiments, attitudes and concerns about inclusive education revised' tool was used to measure their engagement (Tuncay and Kizilaslan 2022). Takala et al. (2023) highlighted the importance of practical experience and supervision in special education teacher training. The study involved 54 students in master's programs from two universities, and utilized a questionnaire and content analysis. Eight key elements emerged from teaching practice curricula, the main ones being basic special education competence, advanced methods, collaboration, and interaction skills (Takala et al. 2023).

The reviewed studies consistently highlighted the multifaceted challenges faced by deaf students in higher education. Issues such as social isolation, limited access to communication, and lack of supportive environments have emerged as recurring themes. While some studies emphasize the importance of inclusive practices and supportive policies, others highlight the need for specialized interventions and accommodations. The strengths of these studies lie in their diverse methodological approaches and focus on various aspects of the deaf student, hearing students, or faculty experience. However, the reliance on self-reported data poses a limitation because of potential cultural bias. Moreover, there is a lack of longitudinal studies. A stronger research design would incorporate the three perspectives of deaf students, hearing students, and faculty. This is an important consideration because there is likely to be a big gap between how three of them perceive their attitudes towards the inclusion process. Without collecting three of them attitudes, we risk having an illusion of inclusion and not making enough effort towards educational integrity.

Method

Sample and participants

This study involved 864 undergraduate students and 96 academic faculty members in the faculty of specific education, at Zagazig University, the only public higher education college in El-Sharqiyah region. The study focused on creating a more inclusive educational experience for both DHH and hearing students in computer software classes. Different conditions used for educational environments were considered as mentioned in the inclusive educational study (Krutz et al. 2015). The survey used stratified random sampling to select respondents. All the participants provided informed consent and were part of the relevant ethics review board. The participants were free to withdraw at any time without completing the questionnaire and did not participate. DHH students and hearing peers, as well as academic faculty members, participated in a survey on attitudes towards inclusion, with a response rate of over 25%.

The academic levels of students and the duration of teaching DHH students to faculty were characteristic of the frequency of contact in the college. Academic levels 1, 2, 3, and 4 characterize the frequency of contact with DHH groups as low, intermediate I, intermediate II, and high, respectively. The surveyed faculty completed the questionnaire during the six academic years 2017–2022. Academic teaching hours below 20 h represented the low-frequency contact group, 20–40 h represented the intermediate-I-frequency contact group, 40–80 h represented the intermediate-II-frequency contact group, and teaching hours over 80 h represented the high-frequency contact group.

Measures

Three online questionnaires were designed with two sections, background information and implicit attitudes. Questionnaires were used to evaluate the educational attitudes of hearing peers, DHH students, and faculty towards the inclusion process. It is noticeable that many words are used across the three questionnaires such as 'prejudiced, 'dissatisfied', 'feel sorry', and 'accommodate' so academic integrity could be deduced from attitudes. Authors avoided using legal terminology in documents and instructions to decrease anxiety about judgment and enhance students' feeling of inclusion at university without feeling it a criminal investigation as recommended by (McNeill 2022). The first questionnaire included questions for DHH students regarding gender (male, female) and level (1, 2, 3, and 4), which represented the frequency of that contact, and the contact quality surveyed through the type of pre-university school (deaf classes, general classes) and reason for deafness (injury/disease, genetic). Implicit attitudes were measured using a 5-point Likert scale for positive and negative attitude items associated with out-of-group such as DHH individuals as recommended by (Schmidt and Boland 1986). A list of the attitudes is presented in Table A (see supplementary material). Attitudes were assessed on a 5-point Likert scale (*1 = very unfavorable, 2 = unfavorable, 3 = neutral, 4 = favorable, and 5 = very favorable*).

Attitudes of homogeneous hearing peers were examined using the CATCH questionnaire as recommended by (Alnahdi 2020; Radici et al. 2022), which measures attitudes based on contact frequencies (levels 1, 2, 3, and 4) and background information, including gender (male, female) and experience with deaf (training, personal experience,

none), which measured the contact quality of hearing peers. The second questionnaire consists of three attitude components (cognitive, affective, and behavioral) with 10 statement items, each rated on a 5-point Likert scale (see supplementary material Table B). Higher scores indicate a more positive attitude toward DHH students (*1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree*).

Similarly, the faculty's attitude questionnaire was scored on a 5-point Likert scale. The reliability and validity of the third questionnaire were ensured through Cronbach's value and expert review, resulting in excellent reliability and validity for measuring the attitudes of faculty regarding DHH students. The background variables section aimed to gather information about the respondents' backgrounds and how they influenced their attitudes toward the inclusion process. Demographic characteristics included gender (male, female) and age (under 40, 41–50, 51–60, and over 61). Contact quality was measured through prior background with deaf (training, personal experience, none), while the frequency of contact was represented by experience in teaching DHH students (participated in under 20 h, 20–40 h, 40–80 h, over 80 h). The questionnaire related to perceived attitudes towards inclusive education contained 27 questions, with three sections focusing on cognition, affect, and behavioral attitudes (see supplementary material Table C).

Statistical analysis

SPSS v.25 was used for data analysis and reliability testing, including tests for normality, homogeneity of variances, t-tests, one-way ANOVA, and post-hoc comparisons. The reliability of the questionnaire and its components were assessed using Cronbach's α, with values ranging from 0.715 to 0.979. Questionnaires II and III had higher overall instrument reliability (Cronbach's $\alpha = 0.918$ and 0.869, respectively) than Questionnaire I (Cronbach's $\alpha = 0.796$). Hence, all the instruments and their variable components had high internal consistency, with Cronbach's α for the whole instrument indicating that only approximately 20.4%, 8.2%, and 13.1% of responses of the students were attributed to errors in Questionnaires I, II, and III, respectively. Thus, the questionnaires were also found to be reliable for measuring the attitudinal scores in our sample.

Furthermore, validity tends to support the extent to which an instrument's scores measure what it is designed to evaluate, namely, attitude. The validity of the instrument was determined using the extraction method of factorial principal component analysis. For Questionnaire I, both the extracted positive and negative attitudes had a high internal structural validity of 0.722. For Questionnaires II and III, the extracted cognition, affect, and behavioral attitudes had high to moderate internal validity, equal to 0.569 and 0.738, 0.754 and 0.899, and 0.519 and 0.819, respectively. Thus, it can be concluded that validity was established among all the instruments.

Results

To assess the successful academic integrity of inclusion in universities, this study investigated the participant characteristics, participant gender, the frequency of contact reflected by the academic level of students or the teaching duration of faculty, and the contact quality based on pre-university school type and deafness reason of DHH students, and based on experience with deaf interaction of hearing peers and faculty.

As shown in Table 1, the student participants were distributed across four academic levels. The majority of the DHH and hearing peers who participated in the study were male, aged 21 ± 3 years. Most of the DHH students were in deaf classes' pre-university schools and had genetic deafness. Most hearing students had no experience with deaf. The common positions of the faculty participants were female, aged 41–50 years, had no prior background with a deaf, and had experience in teaching DHH students for over 80 h.

Various statistical tests were conducted to determine the differences based on participant background variables. With a confidence level of 95%, the normality analysis found that there was a gender response with a Shapiro–Wilk value of full scores equal to zero

Table 1 Background information of the participants

DHH Students' Information (*N* = 144)			
Variables		**Number**	**%**
Level	**1**	40	27.8
	2	37	25.7
	3	35	24.3
	4	32	22.2
Gender	**Male**	77	53.5
	Female	67	46.5
Type of Pre-university School	**Deaf Classes**	139	96.5
	General Classes	5	3.5
Deafness Reason	**Injury / Disease**	21	14.5
	Genetic	123	85.5
Hearing Peers' Information (*N* = 720)			
Variables		**Number**	**%**
Level	**1**	184	25.6
	2	173	24.0
	3	176	24.4
	4	187	26.0
Gender	**Male**	406	56.4
	Female	314	43.6
Prior Experience with Deaf Contact	**Training**	1	0.1
	Personal Experience	45	6.3
	None	674	93.6
Faculty Members' Information (*N* = 96)			
Variables		**Number**	**%**
Gender	**Male**	12	12.5
	Female	84	87.5
Age	**Under 40 Years**	27	28.2
	41–50 Years	49	51
	51–60 Years	14	14.6
	Over 61 Years	6	6.2
Prior Experience with Deaf Contact	**Training**	23	23.9
	Personal Experience	9	9.4
	None	64	66.7
Duration of Teaching DHH Students	**Under 20 Hours**	17	17.7
	20–40 Hours	22	22.9
	40–80 Hours	20	20.8
	Over 80 Hours	37	38.6

for both males and females DHH students. Regarding hearing peers, there was a gender response where the Shapiro–Wilk values of the three components and full-score attitudes were zero for both males and females. Significant differences in the t-test existed in different gender attitudes, as indicated by their full score, where male DHH students and hearing peers had higher positive scores than females, as shown in Table D and E, respectively (see supplementary material Table D and Table E).

Regarding faculty, the Shapiro–Wilk normality analysis found no significant difference in faculty attitudes based on gender. The Shapiro–Wilk values of males and females were 0.129 and 0.102 for cognitive attitude, 0.439 and 0.447 for affective attitude, 0.053 and 0.353 for behavioral attitude, and 0.008 and 0.155 for full-score attitudes, respectively, which prevented the application of the t-test.

Contact frequency influence

Contact frequency refers to the extent to which individuals come into contact with DHH students regularly. The majority of the participants had favorable positive attitudes and unfavorable negative attitudes. As shown in Figs.1, 2, and 3, the frequency agreement charts of DHH students, hearing peers, and faculty, respectively, showed that the majority had agreed attitudes towards the inclusion process in the university, which improved with increased contact frequency.

Deaf or hard-of-hearing students

Focusing on the predictors of DHH students' attitudes, our study emphasizes the influence of contact frequency. Relation between contact frequency and attitudes may provide insights into the levels of acceptance, support, and understanding these students receive within an educational setting. One-way ANOVA test results showed that there were no significant differences at the 0.05 level in positive, negative, and full-score attitudes among DHH students with increased contact frequency, as shown in Table 2. a.

Hearing peers

Analysis of the results of the three attitude subscales, in Figs. 1, 2, and 3, revealed that hearing peers were aware of being neighbors with DHH students and enjoyed their company, but felt sorry about their situation and were hesitant to make friends. Preconceived notions and stigmas surrounding deafness can lead to limited opportunities for contact and hinder inclusion quality. By challenging these stigmas through awareness campaigns and education, societies can foster environments that encourage frequent contact and ensure a high-quality inclusion process. Table 2. b shows that there were significant differences at the 0.05 level in affective, behavioral, and full-score attitudes among hearing peers with different contact frequencies. When there was a difference, Scheffe's test was used to perform a post-hoc comparison. The correlations between peer frequency of contact and significant attitudes are shown in Table F (see supplementary material).

Academic faculty

Another crucial aspect affecting the inclusion of DHH students is the contact frequency that the faculty members receive regarding inclusive practices. As shown in Table 2. c, contact frequency was a significant predictor of the cognitive, affective, behavioral, and

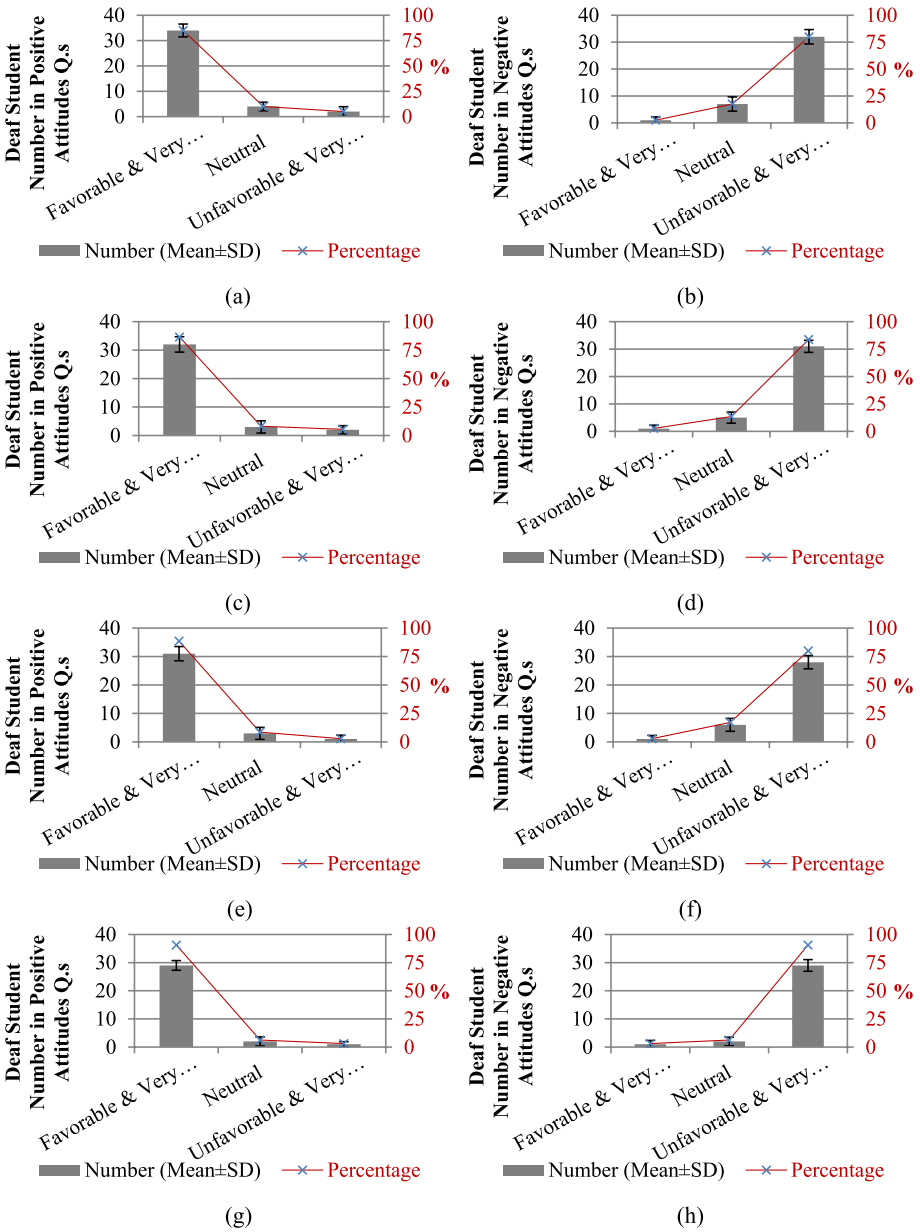

Fig. 1 Attitudes of DHH students for questionnaire I: (**a**), (**c**), (**e**), and (**g**) Positive attitudes of the low, intermediate I, intermediate II, and high-frequency contact groups, respectively. (**b**), (**d**), (**f**), and (**h**) Negative attitudes of the low-, intermediate-, intermediate-, and high-frequency contact groups, respectively

full-score attitudes of faculty. The correlations between the contact frequency of faculty and their significant attitudes are presented in Table G (see supplementary material).

Contact quality influence

DHH students and hearing peers

The relationship between contact quality and academic integrity reflected by attitudes of DHH students are influenced by various factors including type of pre-university school and deafness reason. Positive attitudes lead to increased feelings of value,

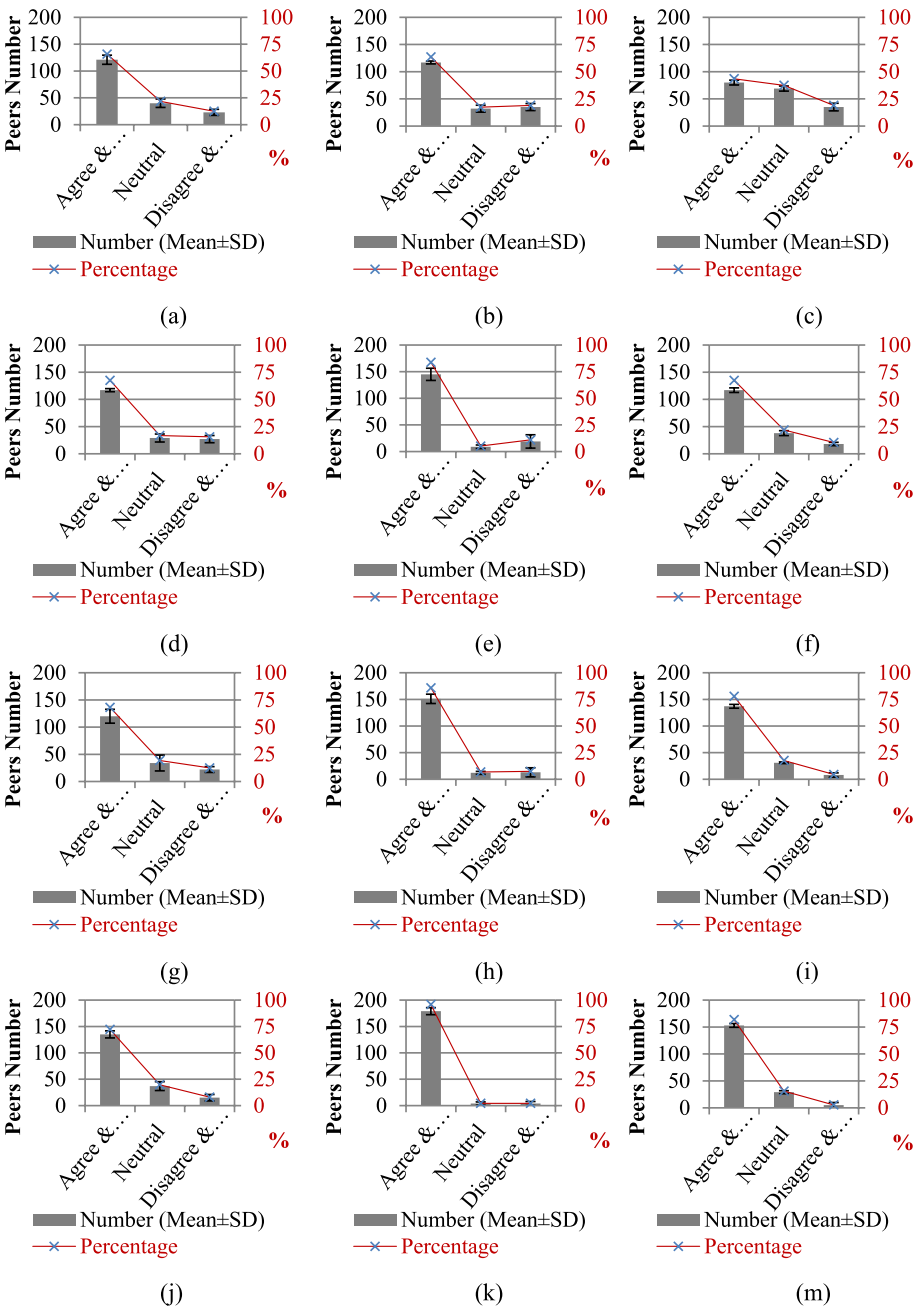

Fig. 2 Attitudes of hearing peers for questionnaire II: (**a**), (**d**), (**g**), and (**j**) Cognitive attitudes of low, intermediate-I, intermediate-II, and high-frequency contact groups, respectively. (**b**), (**e**), (**h**), and (**k**) Affective attitudes of low-, intermediate-, intermediate-, and high-frequency contact groups, respectively. (**c**), (**f**), (**i**), and (**m**) Behavioral attitudes of low-, intermediate-, intermediate-, and high-frequency contact groups, respectively

respect, and active engagement in the learning process. This in turn led to improved self-confidence, which in turn enhanced academic integrity. On the other hand, negative attitudes lead to isolation and diminished contact quality. Consequently, the DHH person felt inferior.

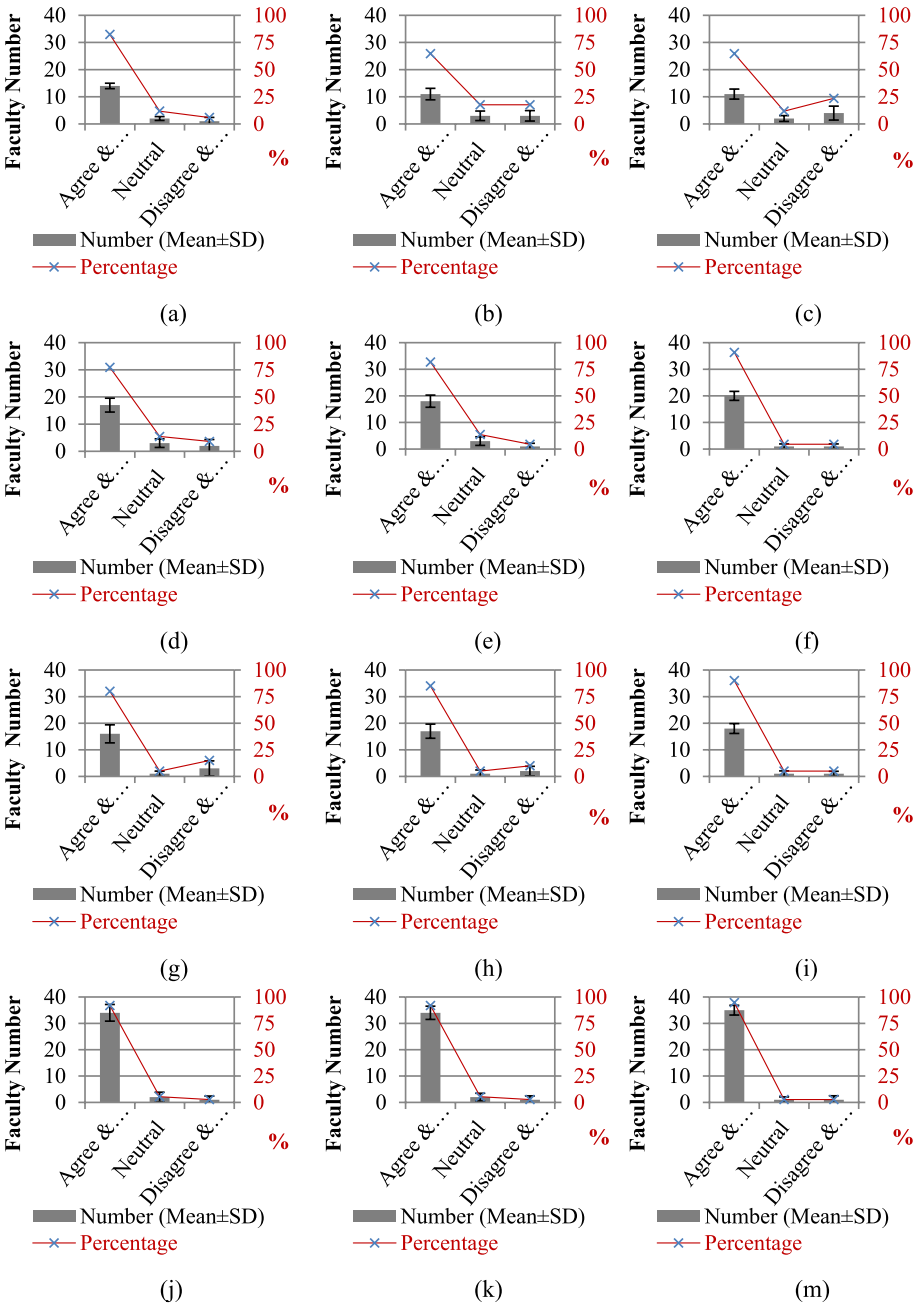

Fig. 3 Attitudes of faculty for questionnaire III: (**a**), (**d**), (**g**), and (**j**) Cognitive attitudes of low, intermediate-I, intermediate-II, and high-frequency contact groups, respectively. (**b**), (**e**), (**h**), and (**k**) Affective attitudes of low-, intermediate-, intermediate-, and high-frequency contact groups, respectively. (**c**), (**f**), (**i**), and (**m**) Behavioral attitudes of low-, intermediate-, intermediate-, and high-frequency contact groups, respectively

Firstly, normality analysis showed no significant differences in the attitudes of DHH students based on the type of pre-university school. The Shapiro–Wilk values of the full scores were 0.104 and 0.014 for the deaf and general classes, respectively, preventing the use of the t-test.

Secondly, there was a response regarding the reason for deafness with Shapiro–Wilk values of full scores equal to zero and 0.008 for injury/disease and genetic deafness

Table 2 ANOVA association of attitude with different contact frequency and quality

a. DHH Student Attitude											
		1. Contact Frequency					2. Contact Quality				
Attitude	**ANOVA**	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig**	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig**
Positive	**Between Groups**	0.322	3	0.107	0.464	0.708	-	-	-	-	-
	Within Groups	32.401	140	0.231	-	-	-	-	-	-	-
	Total	32.723	143	-	-	-	-	-	-	-	-
Negative	**Between Groups**	0.362	3	0.121	0.589	0.623	-	-	-	-	-
	Within Groups	28.716	140	0.205	-	-	-	-	-	-	-
	Total	29.079	143	-	-	-	-	-	-	-	-
Full-scores	**Between Groups**	0.085	3	0.028	0.271	0.846	-	-	-	-	-
	Within Groups	14.671	140	0.105	-	-	-	-	-	-	-
	Total	14.756	143	-	-	-	-	-	-	-	-
b. Hearing Peers Attitude											
Cognitive	**Between Groups**	4.568	3	1.523	1.390	0.245	0.134	2	0.067	0.061	0.941
	Within Groups	784.339	716	1.095	-	-	788.772	717	1.100	-	-
	Total	788.907	719				788.907	719			
Affective	**Between Groups**	51.733	3	17.244	27.684	0.000*	0.416	2	0.208	0.300	0.741
	Within Groups	445.993	716	0.623	-	-	497.310	717	0.694	-	-
	Total	497.726	719	-	-	-	497.726	719	-	-	-
Behavioral	**Between Groups**	54.904	3	18.301	22.839	0.000*	3.364	2	1.682	1.929	0.146
	Within Groups	573.739	716	0.801	-	-	625.279	717	0.872	-	-
	Total	628.643	719	-	-	-	628.643	719	-	-	-
Full-scores	**Between Groups**	27.822	3	9.274	30.796	0.000*	0.173	2	0.087	0.255	0.775
	Within Groups	215.623	716	0.301	-	-	243.272	717	0.339	-	-
	Total	243.445	719	-	-	-	243.445	719	-	-	-

Table 2 (continued)

a. DHH Student Attitude											
		1. Contact Frequency					2. Contact Quality				
Attitude	**ANOVA**	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig**	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig**
c. Faculty Attitude											
Cognitive	**Between Groups**	3.875	3	1.292	5.477	0.002*	0.099	2	0.050	0.181	0.835
	Within Groups	21.698	92	0.236	-	-	25.474	93	0.274	-	-
	Total	25.573	95	-	-	-	25.573	95	-	-	-
Affective	**Between Groups**	3.832	3	1.277	5.739	0.001*	0.323	2	0.162	0.627	0.537
	Within Groups	20.475	92	0.223	-	-	23.984	93	0.258	-	-
	Total	24.307	95	-	-	-	24.307	95	-	-	-
Behavioral	**Between Groups**	6.036	3	2.012	7.291	0.000*	0.357	2	0.178	0.534	0.588
	Within Groups	25.391	92	0.276	-	-	31.070	93	0.334	-	-
	Total	31.427	95	-	-	-	31.427	95	-	-	-
Full-scores	**Between Groups**	3.193	3	1.064	6.560	0.000*	0.085	2	0.042	0.219	0.804
	Within Groups	14.925	92	0.162	-	-	18.033	93	0.194	-	-
	Total	18.117	95	-	-	-	18.117	95	-	-	-

* $\rho < 0.05$

reasons, respectively. Attitudes regarding the reasons for deafness indicated that injured and diseased deaf persons tended to have more positive attitudes than their genetic counterparts, as shown in Table H (see supplementary material). The reasons for this positive attitude are worthy of further study, as prior knowledge before being a DHH person plays an important role in DHH students' attitudes and effective communication with others. Effective communication methods not only ensure the inclusion process but also foster a positive learning environment for all students.

For hearing peers, Table 2. b shows that there were no significant differences in the three attitude components and full-score attitudes among hearing peers with different contact experiences.

Academic faculty

On the other hand, contact quality refers to the depth and meaningfulness of the interactions between faculty and DHH students. As shown in Table 2. c, the contact quality of the faculty had no significant differences in the three attitude components and the full-score attitudes.

Discussion

Gender effect

Analysis of gender results for DHH students and hearing peers indicate that gender could be identified as an influencing factor in the inclusion process, which may have different social skills, communication skills, and adapted supporting systems. Gender differences in peer interaction were found in literature studies (Martin et al. 2011; Wolters et al. 2011), with DHH girls showing higher social competence and acceptance, while boys demonstrated more withdrawn and antisocial behavior; girls' social adjustment was influenced by educational setting, with increased integration leading to higher social participation and emotional security with hearing peers. The ability to generalize these findings was difficult as the association between gender and frequency or quality of contact was not explored. On the other hand, gender results for faculty are consistent with the previous study that found no significant effect for faculty gender (Fabich 2005), while another study mentioned that effect (Goddard and Evans 2018).

Contact frequency influence

Frequent encounters with DHH students in low-, intermediate-I-, intermediate-II-, and high-frequency contact groups have the potential to foster positive attitudes through increased familiarity, understanding, and empathy. This allows for the challenge of personal assumptions or stereotypes, leading to a more inclusive and accepting environment. Increased contact frequency also provides opportunities for meaningful interactions that can promote awareness and reduce barriers between hearing and deaf communities, which might be partly explained according to the theory of planned behavior (Ajzen 1991).

Deaf or hard-of-hearing students

DHH students face challenges in people's acceptance and popularity, so they are more likely to have less contact frequency on a regular campus and have fewer friends in class. This result indicates that the frequency of contact is insufficient to improve attitudes, which is consistent with the findings of a previous study (Alnahdi et al. 2020). Also, this result supported Allport's hypothesis of intergroup contact and stressed that appropriate conditions need to be found concerning contact (Antia et al. 2002; Allport et al. 1954). Al-Hashimi et al., 2021 mentioned that segregating deaf students in self-contained classrooms for theory-based courses and customizing the content to align with their linguistic abilities can enhance their educational achievements (Al Hashimi et al. 2021).

Hearing peers

By involving hearing students in the education of DHH students, contact frequency increases. Frequent interactions between DHH students and hearing peers can help break down barriers, promote understanding, and facilitate social integration. The frequency of communication with others provides a positive attitude toward them (Kompara et al. 2021). Hearing peers can gain knowledge and skills in connecting college DHH students with inclusive learning, these kinds of learning opportunities should affect their attitudes toward DHH students in their future careers, which is similar to the findings of this study (Takala et al. 2023). Also, hearing peers who were connected to a person with a handicap had more favorable attitudes toward people with disabilities (Ying et al. 2017). However, our findings conflict with those of (Siah et al. 2023), who found that contact frequency is negatively associated with secondary-school hearing peers' attitudes toward DHH people. This might be because students in higher education are more accustomed to working with DHH students than students in the secondary stage and have high-range contact frequency. Also, contact with the deaf in college may affect attitudes toward inclusion because it may foster favorable attitudes and decrease prejudice, according to Allport's intergroup communication hypothesis (Allport et al. 1954).

Academic faculty

Contact frequency significantly predicted faculty's cognitive, affective, behavioral, and overall attitudes. This result indicates that faculty do their best to help all students equally and provide educational assistance with increased contact frequency, which in turn leads to achieving academic integrity. The faculty's overall positive attitude is consistent with the findings of (Gregory and Noto 2018; Wang 2020). However, other studies have indicated that faculty tend to hold neutral attitudes toward inclusive education (Lindner et al. 2023).

Contact quality influence

Deaf or hard-of-hearing students

The biggest problem that DHH students experience is a breakdown in communication with the hearing world, since the hearing world communicates via the sound of

speaking and hearing, whereas the deaf community communicates through silence of sign and sight (Al-Hassan et al. 2023). So, contact occurs when those involved can comprehend people and pass messages to them. This is consistent with the attempt of Ying et al. 2017 to reduce the gap between the world of the deaf and others (Ying et al. 2017). Prior research studied student challenges with academic integrity concerning papers and procedures, like anxiety linked to protocols (Sanni-Anibire et al. 2021).

Antia, 2002 stated that inclusive education for DHH students goes beyond mere placement and communication access. It requires addressing teacher attitudes, roles, and relationships, as well as structural barriers and extracurricular activities (Antia, 2002). To ensure social equity and provide the same classroom experience, innovative solutions like Smart Learning Assistance tools using Deep Learning and Computer Vision techniques can facilitate two-way communication between DHH students, teachers, and peers (Srivastava et al. 2021). Despite legislative actions promoting inclusion, varied interpretations of policies and an emphasis on assimilation have often resulted in isolating experiences for DHH students (Silvestri and Hartman 2022). In physical education classes, for instance, DHH students reported feeling excluded and invisible due to communication barriers and lack of teacher interaction (Tanure Alves et al. 2021).

Kersting 1997 revealed that students who arrive on campus without knowledge of sign language or familiarity with deaf culture may experience feelings of isolation, loneliness, and resentment, particularly during their first year. This can lead to alienation from both the deaf student community and hearing peers (Kersting 1997). Interestingly, deaf students' perceptions of academic quality are not significantly impacted by their deafness. DHH evaluates their programs just as positively as hearing students, although they are more likely to adopt a reproducing orientation in their studies, especially those who prefer to communicate through sign language (Richardson et al. 2004). However, DHH students may face challenges in acquiring information in the classroom compared to their hearing peers, which can be exacerbated by negative experiences with assistive technologies (Mallary 2019).

Gugenheimer et al. 2017 concluded that deaf individuals who use sign language and those who use cochlear implants (CIs) and speech have distinct communication experiences and challenges in educational settings. Deaf signers often face communication barriers in face-to-face interactions with hearing people, which can impact the quality of their educational experiences. Real-time translation technologies, while helpful, may reinforce the subordination of deaf culture by emphasizing the deficiency in mastering the dominant form of communication (Gugenheimer et al. 2017). On the other hand, deaf individuals with CIs can develop excellent spoken language skills and often integrate into mainstream educational settings (Peterson et al. 2010; Scattergood and Limb 2010). However, their success varies widely, with some CI users never developing usable speech and oral language skills (Peterson et al. 2010). A Bertone and Volpato 2009 study comparing different groups of deaf individuals found that cochlear-implanted children performed significantly better in linguistic competence tests than native signers, non-native signers, and deaf foreigners. The study also suggests that a combination of oral training and sign language might be the best strategy for accessing oral language and communicating with both deaf and hearing in educational settings (Bertone and Volpato 2009).

Quaye 2023 research indicated that robust and equitable support is crucial for their academic and social integration. Deaf signers may experience more communication barriers in predominantly hearing environments, while CI users often integrate more easily into mainstream settings. Moreover, Poor speech intelligibility and difficulties in social interaction, even with the assistance of CIs or hearing aids, contribute to loneliness and less coherence for DHH students, especially in group situations and noisy environments. This revealed the importance of inclusive quality and fair support to effectively participate in mainstream classrooms of higher education (Quaye 2023).

For successful inclusive teaching, Hitch et al. 2015 mentioned that two lines of requirements should be provided; a desktop audit of inclusive teaching and an assessment of the methods used (Hitch et al. 2015). Hence, the effective inclusion of DHH students requires a multifaceted approach. This includes; (1) the use of classroom technology and culturally responsive education that integrates sign language and deaf culture (Silvestri and Hartman 2022). Ensuring that educational institutions embrace and integrate these technological advancements into their inclusive practices is vital to providing a high-quality inclusion process (Baird and Dooey 2014). DHH students need learning media, adapted educational content, visual stimulation via an animated human or avatar, and real-time text display with speaker identification (Batanero et al. 2019; De Martino et al. 2016; Kushalnagar et al. 2018; Reedy et al. 2021). (2) Providing an appropriate educational environment, comprehensive support services, documentation systems, and individualized education programs are essential (Alsalem and Alzahrani 2023). These lines can greatly enhance the academic integrity of inclusion of DHH students and overcome the superficial or limited interactions of the educators and faculty.

Hearing peers

The result of no significant differences in the three attitude components and full-score attitudes among hearing peers with different contact experiences makes sense because, without the existence of contact frequency in the classroom, promoting better inclusion quality could not develop students' empathetic and inclusive attitudes. Even the contact quality, achieved by having family members with impairments, did not significantly predict attitudes (Alnahdi et al. 2020).

Academic faculty

On the other hand, the results showed that the contact quality had no significant differences in the three attitude components and the full-score attitudes of the educational faculty. Research on inclusive education among school teachers has shown similar findings, but there is no specific research applicable to faculty at higher educational levels (Halder 2023; Savolainen et al. 2022; Tuncay and Kizilaslan 2022). Previous studies have investigated the teachers' attitudes toward interaction with students with hearing loss (Eriks-Brophy and Whittingham 2013). Moreover, many studies indicate that teachers with special education training have a more positive attitude than teachers without special education training toward inclusive education of students with disabilities (Alsolami and Vaughan 2023; Hassanein et al. 2021; Sharma and Nuttal 2016; Tully 2023).

Finally, the faculty must be able to recognize special educational teaching time that should reflect DHH students' needs and assist in considering their learning needs and arrangements when designing the curriculum and activities, understanding DHH students' learning situations, and adjusting difficult assignments per DHH students' study situations (Braun et al. 2018; Takala et al. 2023). Faculty generally report making few, if any, modifications for deaf students and often view support service faculty as responsible for these students' success or failure. This highlights the need for improved awareness and training for faculty to better support deaf students in higher education (Foster et al. 1999). To enhance the transition process and overall experience for deaf students, it is crucial to provide comprehensive support services, including guidance on university choices, awareness of the differences between school and higher education, and strategies to overcome barriers to equal access (Foster et al. 1999; Saunders 2012).

Strengths and limitations

Academic integrity seeks to strengthen the university's reputation by fostering originality and honesty. To support this, a culture of best practices should be cultivated among students and faculty members. The findings significantly improve our understanding of how the frequency and quality of inclusive contact are vital in shaping the demands of academic integrity. This research offers valuable insights into the attitudes of DHH students, hearing peers, and faculty in promoting successful academic integrity. This study's strength lies in insights collected from diverse student and faculty experiences. This study could be replicated at other colleges to examine the impact of inclusion practices on academic integrity. Furthermore, the findings of this study can enhance institutional policies for successful inclusion that can be implemented elsewhere. The limitations of this study include potential errors in self-reporting that do not rule out the possibility of a social desirability response mistake, its generalizability to other universities and disciplines, and the small sample size. This study highlights the influence of several factors on the inclusion of DHH students. However, the frequency and quality of contact between DHH students and their hearing peers and teachers also depend on the availability of appropriate communication tools, such as sign language interpreters, captioning, or assistive listening devices. The main reason for underrepresented DHH students in universities is their lack of preparation allowing DHH students to effectively understand both verbal and visual aspects of lectures, ensuring equal access to educational materials, and providing support services (Adler et al. 2014; Chua et al. 2017; Kushalnagar et al. 2017; Marshall et al. 2016; Walter et al. 2013). Assessing attitudes and their predictors seems to be the first step in improving attitudes toward inclusion in universities (Alnahdi et al. 2020). Therefore, the strength of this study is that it examines educational integrity during the inclusion process impacted by the attitudes of DHH students, hearing peers, and faculty towards the inclusion process in the Egyptian context, and thus responds to this gap in existing research. Future studies should assess the enhancement of academic integrity among DHH students, their hearing peers, and faculty across various undergraduate programs of other disciplines once initial progress indicators are identified in the present study.

Conclusion

Promoting equality and the educational integrity of DHH students in higher education can be influenced by the frequency and quality of contact they have with educators and hearing peers. Regular communication and interaction provide opportunities for DHH students to receive the necessary information, participate in discussions, ask questions, and seek clarification. Quality interactions also contribute to a positive learning environment, fostering a sense of belonging and support for DHH students in higher education. This study takes into account factors such as student level, gender, type of pre-university school, reason for deafness, experience of hearing peers with deaf contact, faculty's prior experience with deaf contact, and duration of teaching DHH students. The following conclusions were drawn.

(1) Significant differences in gender attitudes prevailed, with male DHH students having a stronger attitude than females. The majority of DHH students had genetic deafness, attended deaf classes in secondary school, and had favorable attitudes toward inclusion. However, they fear challenges transitioning to college post-secondary education, including a lack of support and other hearing peers' views. When universities prioritize all students, particularly those with language differences or accommodation needs, they foster the self-confidence essential for success and bolster academic integrity.
(2) The majority of hearing learners and lecturers agreed to the inclusion of DHH students in the university. For hearing peers, significant differences existed between male and female affective and full-score attitudes, with male hearing peers having higher positive scores than female hearing peers.
(3) There were significant variations in affective, behavioral, and full-score attitudes among hearing peers with varying contact frequencies but not in the three attitude components or full-score attitudes among hearing peers with varying contact quality. This indicates that hearing peers are not negatively affected by DHH students' inclusion.
(4) Contact frequency was a significant predictor of faculty's cognitive, affective, behavioral, and full-score attitudes; however, different contact experiences of faculty, representing contact quality, had no significant differences in the three attitude components or full-score attitudes.
(5) Based on these results, institutions can promote the educational integrity of DHH students' inclusion in higher education by increasing the frequency that hearing peers and faculty interact with DHH students, as well as by improving awareness of faculty and self-advocacy training of students to ensure favorable contact conditions at a personal level. Finally, inclusive education must receive greater attention and recognition as a vital aspect of diversity in educational institutions to uphold academic integrity.

Abbreviations

DHH Deaf or hard of hearing
CIs Cochlear implants

Supplementary Information

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Supplementary Material 1

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References

Adler H, Jacob B, Kurz K, Kushalnagar R (2014) Undergraduate research in mathematics with deaf and hard-of-hearing students: Four perspectives. Involve, a Journal of Mathematics 7(3):247–264. https://doi.org/10.2140/involve.2014.7.247

Ajzen I (1991) The theory of planned behavior. Organ Behav Hum Decis Process 50(2):179–211. https://doi.org/10.1016/0749-5978(91)90020-t

Al-Hassan OM, Bani-Hani KE, Al-Masa'deh MtM (2023) Sign language as a means of inclusion: A case study. International Journal of Disability, Development and Education:1–15. https://doi.org/10.1080/1034912x.2023.2213178

Al-Hashimi S, Sadoun J, Almahoozi Y, Jawad F, Hasan N (2021) Examining perceptions of inclusion of deaf and hard-of-hearing students in art and design higher education in Bahrain. Cogent Arts Humanities 8(1):1960698. https://doi.org/10.1080/23311983.2021.1960698

Allport GW, Clark K, Pettigrew T (1954) The nature of prejudice.

Alnahdi GH (2020) The construct validity of the Arabic version of the Chedoke-McMaster attitudes towards children with handicaps scale. Cogent Education 7(1):1745540. https://doi.org/10.1080/2331186x.2020.1745540

Alnahdi GH, Elhadi A, Schwab S (2020) The positive impact of knowledge and quality of contact on university students' attitudes towards people with intellectual disability in the Arab world. Res Dev Disabil 106:5. https://doi.org/10.1016/j.ridd.2020.103765

Alsalem MA, Alzahrani HA (2023) The role of institutional practice in promoting inclusive education for deaf and hard of hearing students: A critical analysis. SAGE Open 13. https://doi.org/10.1177/21582440231203435

Alsolami A, Vaughan M (2023) Teacher attitudes toward inclusion of students with disabilities in Jeddah elementary schools. PLoS ONE 18(1):e0279068. https://doi.org/10.1371/journal.pone.0279068

Antia SD, Stinson MS, Gaustad MG (2002) Developing membership in the education of deaf and hard-of-hearing students in inclusive settings. J Deaf Stud Deaf Educ 7(3):214–229. https://doi.org/10.1093/DEAFED/2F7.3.214

Baird C, Dooey P (2014) Ensuring effective student support in higher education alleged plagiarism cases. Innov High Educ 39(5):387–400. https://doi.org/10.1007/s10755-014-9285-4

Batanero C, de-Marcos L, Holvikivi J, Hilera JR, Otón S, (2019) Effects of new supportive technologies for blind and deaf engineering students in online learning. IEEE Trans Educ 62(4):270–277. https://doi.org/10.1109/TE.2019.2899545

Batten G, Oakes PM, Alexander T (2014) Factors associated with social interactions between deaf children and their hearing peers: A systematic literature review. J Deaf Stud Deaf Educ 19(3):285–302. https://doi.org/10.1093/deafed/2Fent052

Bertone C, Volpato F (2009) Oral language and sign language: possible approaches for deaf people's language development. Cadernos de Saúde 2 (Especial):51–62. https://doi.org/10.34632/cadernosdesaude.2009.2976
Braun DC, Clark MD, Marchut AE, Solomon CM, Majocha M, Davenport Z, Kushalnagar RS, Listman J, Hauser PC, Gormally C (2018) Welcoming deaf students into stem: Recommendations for university science education. CBE—Life Sciences Education 17 (3):es10. https://doi.org/10.1187/cbe.17-05-0081
Chua M, Ray B, Stein LA (2017) A behind-the-scenes look at access setup: A case study of the deaf professional / designated interpreter model in engineering education research. Paper presented at the 2017 IEEE Frontiers in Education Conference (FIE), 2017/10.
Davis M (2022) Examining and improving inclusive practice in institutional academic integrity policies, procedures, teaching and support. Int J Educ Integr 18:1–20. https://doi.org/10.1007/s40979-022-00108-x
De Martino JM, Silva IR, Bolognini CZ, Costa PDP, Kumada KMO, Coradine LC, Brito PHdS, do Amaral WM, Benetti ÂB, Poeta ET, Angare LMG, Ferreira CM, De Conti DF, (2016) Signing avatars: Making education more inclusive. Univ Access Inf Soc 16(3):793–808. https://doi.org/10.1007/s10209-016-0504-x
Dettman S, Chia YHM, Budhiraja S, Graham L, Sarant J, Barr CM, Dowell RC (2020) Understanding typical support practice for students who are deaf or hard of hearing: Perspectives from teachers of the deaf in Australia. Deaf Educ Int 24:24–48. https://doi.org/10.1080/14643154.2020.1841363
East J, Donnelly L (2012) Taking responsibility for academic integrity: A collaborative teaching and learning design. Journal of University Teaching and Learning Practice. https://doi.org/10.53761/1.9.3.2
Eriks-Brophy A, Whittingham J (2013) Teachers' perceptions of the inclusion of children with hearing loss in general education settings. Am Ann Deaf 158:63–97. https://doi.org/10.1353/AAD.2013.0009
Fabich M (2005) A meta-analysis of demographic characteristics and learning by deaf students. National Technical Institute for the Deaf. [Master Thesis, Rochester Institute of Technology].
Foster S, Long G, Snell K (1999) Inclusive instruction and learning for deaf students in postsecondary education. The Journal of Deaf Studies and Deaf Education 4(3):225–235. https://doi.org/10.1093/deafed/4.3.225
Gehret AU, Michel LV, Trussell JW (2021) Experiential education of deaf and hard of hearing students in the lab with non-signing advisors. Int J Incl Educ 27(8):868–889. https://doi.org/10.1080/13603116.2021.1879948
Goddard C, Evans D (2018) Primary pre-service teachers' attitudes towards inclusion across the training years. Australian Journal of Teacher Education 43 (6):122–142. https://doi.org/10.14221/ajte.2018v43n6.8
Gregory JL, Noto LA (2018) Attitudinal instrument development: Assessing cognitive, affective, and behavioral domains of teacher attitudes toward teaching all students. Cogent Education 5(1):1422679. https://doi.org/10.1080/2331186x.2017.1422679
Gugenheimer J, Plaumann K, Schaub F, Vito PDCS, Duck S, Rabus M, Rukzio E (2017) The impact of assistive technology on communication quality between deaf and hearing individuals. Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing. https://doi.org/10.1145/2998181.2998203
Halder S (2023) Preparing teacher educators for inclusive classroom: Challenges, lacuna and future direction. In: The Routledge Handbook of Inclusive Education for Teacher Educators. Routledge India, pp 3–24. https://doi.org/10.4324/9781003266068-2
Hassanein EE, Alshaboul YM, Ibrahim S (2021) The impact of teacher preparation on preservice teachers' attitudes toward inclusive education in Qatar. Heliyon 7(9):e07925. https://doi.org/10.1016/j.heliyon.2021.e07925
Hitch DP, Macfarlane S, Nihill C (2015) Inclusive pedagogy in Australian universities: A review of current policies and professional development activities. Int J First Year High Educ 6:135–145. https://doi.org/10.5204/INTJFYHE.V6I1.254
Ismail A Teachers' attitudes toward including children with special educational needs in private schools in egypt. In: The European Conference on Education 2018: Official Conference Proceedings, 2018. pp 191–205.
Kelman CAAU, Branco AU (2009) (Meta)communication strategies in inclusive classes for deaf students. Am Ann Deaf 154:371–381. https://doi.org/10.1353/AAD.0.0112
Kersting SA (1997) Balancing between deaf and hearing worlds: Reflections of mainstreamed college students on relationships and social interaction. J Deaf Stud Deaf Educ 2(4):252–263. https://doi.org/10.1093/oxfordjournals.deafed.a014330
Kielblock S, Woodcock S (2023) Who's included and Who's not? An analysis of instruments that measure teachers' attitudes towards inclusive education. Teach Teach Educ 122:103922. https://doi.org/10.1016/j.tate.2022.103922
Kompara M, Hölbl M, Družovec TW (2021) Communication challenges in inclusive education faced by deaf and non-deaf people. University of Maribor, University Press, Slovenia. https://doi.org/10.18690/um.feri.2.2022
Koutsouris G, Stentiford L, Norwich B (2022) A critical exploration of inclusion policies of elite UK universities. Br Edu Res J. https://doi.org/10.1002/berj.3799
Krutz DE, Malachowsky SA, Jones SD, Kaplan JA (2015) Enhancing the educational experience for deaf and hard of hearing students in software engineering. Paper presented at the 2015 IEEE Frontiers in Education Conference (FIE), 2015/10.
Kushalnagar R, Behm G, Ali S, Harvey S, Bercan K (2017) Enhancing participation of deaf engineering students in lab discussion. Paper presented at the ASEE Annual Conference & Exposition Proceedings.
Kushalnagar R, Behm G, Wolfe K, Yeung P, Dingman B, Ali S, Glasser A, Ryan C (2018) RTTD-ID: Tracked captions with multiple speakers for deaf students. Paper presented at the ASEE Annual Conference & Exposition Proceedings.
Laabidi M, Jemni M, Jemni Ben Ayed L, Ben Brahim H, Ben Jemaa A (2014) Learning technologies for people with disabilities. Journal of King Saud University - Computer and Information Sciences 26 (1, Supplement):29–45. https://doi.org/10.1016/j.jksuci.2013.10.005
Lindner K-T, Schwab S, Emara M, Avramidis E (2023) Do teachers favor the inclusion of all students? A systematic review of primary schoolteachers' attitudes towards inclusive education. Eur J Spec Needs Educ 38(6):766–787. https://doi.org/10.1080/08856257.2023.2172894
Lord JE, Stein MA (2018) Pursuing inclusive higher education in Egypt and beyond through the convention on the rights of persons with disabilities. Social Inclusion 6 (4):230–240. https://doi.org/10.17645/si.v6i4.1709

Mallary KJ Autoethnographic approach to studying the affective information behavior of a deaf student. In: Stephanidis C (ed) HCI International 2019 - Posters, Cham, 2019// 2019. Springer International Publishing, pp 269–273. https://doi.org/10.1007/978-3-030-23522-2_34
Marshall MM, Carrano AL, Dannels WA (2016) Adapting experiential learning to develop problem-solving skills in deaf and hard-of-hearing engineering students. J Deaf Stud Deaf Educ 21(4):403–415. https://doi.org/10.1093/deafed/enw050
Martin D, Bat-Chava Y, Lalwani AK, Waltzman SB (2011) Peer relationships of deaf children with cochlear implants: predictors of peer entry and peer interaction success. J Deaf Stud Deaf Educ 16(1):108–120. https://doi.org/10.1093/deafed/2Fenq037
McHaney RW, Cronan TP, Douglas DE (2016) Academic integrity: Information systems education perspective. J Inf Syst Educ 27:153–158
McNeill L (2022) Changing "Hearts" and Minds: Pedagogical and institutional practices to foster academic integrity. In: Eaton SE, Christensen Hughes J (eds) Academic Integrity in Canada: An Enduring and Essential Challenge. Springer International Publishing, Cham, pp 487–503. https://doi.org/10.1007/978-3-030-83255-1_25
Morina A, Orozco I (2020) Planning and implementing actions for students with disabilities: Recommendations from faculty members who engage in inclusive pedagogy. Int J Educ Res 103:101639. https://doi.org/10.1016/j.ijer.2020.101639
Oreshkina O, Gurov A (2019) Solving the problem of limited content accessibility in natural science disciplines for students with hearing impairments in technical university. Paper presented at the 2019 IEEE Global Engineering Education Conference (EDUCON), 2019/04.
Peterson NR, Pisoni DB, Miyamoto RT (2010) Cochlear implants and spoken language processing abilities: Review and assessment of the literature. Restor Neurol Neurosci 28:237–250. https://doi.org/10.3233/rnn-2010-0535
Pettigrew TF, Tropp LR (2006) A meta-analytic test of intergroup contact theory. J Pers Soc Psychol 90(5):751–783. https://doi.org/10.1037/0022-3514.90.5.751
Quaye R (2023) Teaching strategies in basic mathematical operations for hearing impaired learners at the university practice inclusive school-south campus, Winneba Ghana. Afr J Educ Sci Technol 7(3):428–435. https://doi.org/10.2022/ajest.v7i3.851
Radici E, Heboyan V, Mantovani F, De Leo G (2022) Attitudes and perceived communicative competence: The impact of different AAC means of communication among Italian teenagers. Int J Disabil Dev Educ 69(3):976–986. https://doi.org/10.1080/1034912x.2020.1740185
Reedy AK, Wurm PAS, Janssen A, Lockley A (2021) A community of practice approach to enhancing academic integrity policy translation: A case study. Int J Educ Integr 17(1):12. https://doi.org/10.1007/s40979-021-00080-y
Richardson JTE, Barnes L, Fleming J (2004) Approaches to studying and perceptions of academic quality in deaf and hearing students in higher education. Deaf Educ Int 6(2):100–122. https://doi.org/10.1179/146431504790560591
Sanni-Anibire H, Stoesz BM, Gervais L, Vogt L (2021) International students' knowledge and emotions related to academic integrity at Canadian postsecondary institutions. Int J Educ Integr 17(1):21. https://doi.org/10.1007/s40979-021-00088-4
Saunders J (2012) The support of deaf students in the transition between further education and school into higher education. Deaf Educ Int 14(4):199–216. https://doi.org/10.1179/1557069x12y.0000000011
Savolainen H, Malinen O-P, Schwab S (2022) Teacher efficacy predicts teachers' attitudes towards inclusion–a longitudinal cross-lagged analysis. Int J Incl Educ 26(9):958–972. https://doi.org/10.1080/13603116.2020.1752826
Scattergood L, Limb CJ (2010) Music perception in children with cochlear implants. Perspect Hear Hear Disord Childhood 20:32–37. https://doi.org/10.1044/HHDC20.1.32
Schmidt DF, Boland SM (1986) Structure of perceptions of older adults: evidence for multiple stereotypes. Psychol Aging 1(3):255. https://doi.org/10.1037/0882-7974.1.3.255
Sharma U, Nuttal A (2016) The impact of training on pre-service teacher attitudes, concerns, and efficacy towards inclusion. Asia-Pacific J Teach Educ 44(2):142–155. https://doi.org/10.1080/1359866X.2015.1081672
Siah PC, Tan CS, Lee WY, Lee MN (2023) An intergroup contact approach for understanding attitudes and behaviours towards deaf students among hearing students in Malaysia. Equal Diver Inclusion: an Int J 42(7):927–942. https://doi.org/10.1108/edi-03-2022-0059
Silvestri JA, Hartman MC (2022) Inclusion and deaf and hard of hearing students: Finding asylum in the LRE. Educ Sci 12(11):773. https://doi.org/10.3390/educsci12110773
Srivastava S, Varshney A, Katyal S, Kaur R, Gaur V (2021) A smart learning assistance tool for inclusive education. J Intell Fuzzy Syst 40:11981–11994. https://doi.org/10.3233/JIFS-210075
Takala M, Sutela K, Ojala S, Saarinen M (2023) Teaching practice in the training of special education teachers in Finland. Eur J Spec Needs Educ 38(6):835–849. https://doi.org/10.1080/08856257.2023.2177945
Tanure Alves ML, de Souza JV, Grenier M, Lieberman L (2021) The invisible student in physical education classes: Voices from deaf and hard of hearing students on inclusion. Int J Incl Educ 28(3):231–246. https://doi.org/10.1080/13603116.2021.1931718
Taylor E, Callahan E, Pinta K, Yeatts L, Winiecki D (2017) Increasing academic performance of deaf students at Alpha university: A case study. Perform Improv 56(8):16–26. https://doi.org/10.1002/pfi.21720
Tully JP (2023) Preparing pre-service music educators to more effectively teach students with special needs. [Ph.D. Thesis, School of Music, Liberty university].
Tuncay AA, Kizilaslan A (2022) Pre-service teachers' sentiments, attitudes and concerns about inclusive education in Turkey. Eur J Spec Needs Educ 37(2):309–322. https://doi.org/10.1080/08856257.2021.1873524
UN (2015) Transforming our world: the 2030 agenda for sustainable development. United Nations. https://sdgs.un.org/2030agenda.
Walter W, Schrlau M, Iglesias P, Leipold K, Nichols T (2013) Investigation of the benefits of using a case study method to teach mechanical engineering fundamentals courses to deaf and hard of hearing students. Paper presented at the ASEE Annual Conference & Exposition Proceedings.

Wang HY (2020) Attitudes towards inclusive education among instructors at universities in Taiwan. International Journal of Disability, Development and Education, vol 70. Informa UK Limited. https://doi.org/10.1080/10349 12x.2020.1849575

Weatherton YP, Mayes R, Villanueva-Perez C Barriers to persistence of engineering students with disabilities: A review of literature. In: Proceedings of the 124th Annual American Society for Engineering Education Conference, 2017. p 12.

Wolters N, Knoors H, Cillessen AHN, Verhoeven L (2011) Predicting acceptance and popularity in early adolescence as a function of hearing status, gender, and educational setting. Res Dev Disabil 32(6):2553–2565. https://doi.org/ 10.1016/j.ridd.2011.07.003

Ying LW, Chee-Seng T, Chua SP, Ngee LM Attitude towards deaf people among malaysian secondary school students. In: Proceedings of International Conference on Special Education, 2017. vol (2017). SEAMEO Regional Centre for Special Educational Needs, pp 27-33. doi:https://zenodo.org/record/6900216

Yuknis C (2015) Attitudes of pre-service teachers toward inclusion for students who are deaf. Deaf Educ Int 17(4):183–193. https://doi.org/10.1179/1557069x15y.0000000003

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