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RELATIONSHIP BETWEEN EDUCATIONAL FACTORS AND ACADEMIC ACHIEVEMENT OF DEAF AND HARD OF HEARING STUDENTS IN SAUDI UNIVERSITIES: THE MEDIATING ROLE OF TEACHING EXPERTISE

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ABSTRACT

Issues related to academic achievement of deaf and hard of hearing (DHH) students in higher education has led to the need of deep understanding about factors that are related to academic achievement among DHH students. However, studies related to the relationship between educational factors, teaching expertise, and academic achievement among DHH students in Saudi universities are still scarce. To fill the gap, this study aimed to examine the relationship between educational factors and the academic achievement of DHH students in Saudi universities along with the mediating effect of teaching expertise on this relationship. The simple random sampling technique was employed to identify the target participants for this study. Using a quantitative survey approach, data were collected from 298 DHH students from Saudi universities. All questionnaires were analyzed by using structural equation modelling (SEM) via AMOS. The results indicated a statistically significant relationship between educational factors, teaching expertise and the academic achievement. Results revealed a statistically significant relationship between educational factors and teaching expertise. Moreover, a mediating role was found for teaching expertise in the relationship between educational factors and the academic achievement. These findings would offer perception for policy-makers in future planning for such programs, which can positively reflect on the performance of educational institutions, thus improving the academic achievement of DHH students. The study suggests that the teaching expertise and educational factors should be employed to improve academic achievements of DHH students in Saudi universities.

Contribution/Originality: This study is among the few studies in Saudi Arabia that contribute to existing literature on educational factors, teaching expertise and its relationship with the academic achievement of DHH students. The findings have the potential to create a positive change on higher education programs for DHH students in Saudi Arabia.

1. INTRODUCTION

In the Kingdom of Saudi Arabia (KSA), the formal education for the deaf and hard of hearing students (DHH) started in 1964. New institutions were opened for the first time in Riyadh, which included an institution for DHH

girls too (Battal, 2016). The special education for DHH students saw further development between 1987 and 2000. The Ministry gave the approval to accept DHH students in Saudi higher education programs vide No. 7 / B / 9173 in 2001 to complete their university studies (Al-Mousa, 2008). Under the law and since the beginning of 2005, a number of Saudi colleges and universities established a comprehensive access system for DHH students and began constructing programs that included rules and procedures for support factors to meet their needs (Al-Rayes, 2008). A number of DHH students enrolled in higher education programs in Saudi universities and colleges such as College of Telecom and Information (CTI), Arab Open University (AOU), and King Saud University (KSU) (Hanafy & Al-Aydy, 2016). The Ministry of Education (MOE) provided educational services to DHH students in these colleges and universities which included tutoring in the resource room, a note taker, interpreting, hearing technology, group sessions, and classroom modification (Al-Hawi, 2015; Hanafy, 2018). Recently, the Saudi government emphasized that the deaf community and their education was a part of Vision 2030, which will subsequently have a significant impact on the education of DHH students (Al-Omary, 2018).

1.1. Background of Higher Education for DHH Students in the KSA

The actual beginning of higher education programs for DHH students was in 2005, when female students were also enrolled in the Faculty of Education for Home Economics and Art Education in Riyadh city (Al-Rayes, 2008). In the same year, another program was opened for DHH female students at the College of Education in Mecca City. Ten female students were accepted in each program to obtain the Bachelor's degree. In these programs, some support services were provided to these students such as sign language interpreters and assistant teachers for writing lectures, and explaining in the resource rooms (Hanafy & Al-Aydy, 2016). According to Al-Rayes and Al-Kharji (2010) the admission in these programs was suspended in 2006 because there were challenges in real implementation that led to the failure of these programs.

The second program for DHH students was opened at the College of Telecom and Information (CTI) in Riyadh city in 2005. One year later in 2006, a similar program was opened in Hail city. In 2007, another program in the CTI was opened in Al-Qassim city (Al-Rayes, 2008). Special classes were opened for DHH students to obtain a diploma in office applications, special technology, and special technical. The number of accepted students reached 37 in each program, and the CTI made some adjustments in the study plan, prepared computer labs, and provided translators (Al-Rayes & Al-Kharji, 2010).

In 2006, DHH students were enrolled in the Arab Open University (AOU), a private university of open learning. The number of DHH students enrolled in the first year reached 130 to obtain a bachelor's degree in the field of educational studies (Al-Ajlan, 2017). In 2011, King Saud University (KSU) permitted the enrolment of 40 DHH students in College of Education to obtain the Bachelor's degree in special education, art education, and physical education (Al-Zahrani, 2015). The human cadres specialized in the Arabic language, faculty members, translators, and administrative support staff were recruited and trained on ways to communicate with DHH students, in addition to equipping the halls with advanced and modern electronic equipment (Al-Hawi, 2015).

In addition, the KSU added a preparatory year that aimed to train DHH students and develop their skills in reading and writing, and provide them with the necessary skills for academic life (Hanafy & Al-Aydy, 2016).

1.2. Educational Factors

Educational factors are academic services that are provided to DHH students to help them learn efficiently in proportion to their educational needs and to achieve the requirements of universities (Hanafy & Al-Saleh, 2018). In KSA, the MOE advocated for the DHH student's access to education and support services (Al-Wabli, 2001). Moreover, educational factors for the DHH students in higher education were the most important priorities which were confirmed by the Saudi organizational rules for special education institutes and programs in 2002 (Hanafy & Al-Aydy, 2016).

In this study, educational factors refer to Modified Classroom Delivery (MCD), Presence of Coordinators (PC), and Note Taking Services (NTS), which are offered through a university's support service office to DHH students. Modified classroom delivery is one of the most important educational factors that have been used to improve the achievement of DHH students (Hadjikakou, Petridou, & Stylianou, 2005). It is an implementation of the IDEA law of 1997 which emphasized the need for special arrangements for DHH students in the classroom (Hanafy & Al-Aydy, 2016). By offering modified classes, faculty members are changing the usual way of delivering lessons to suit DHH students' needs (Hanafy, 2018). For example, modification of the curriculum, diversifying teaching methods, speaking slowly and clearly, reducing tasks, reducing the number of lessons, modifying the language in books, modifying the language in exams, providing additional time during exams, providing books to DHH students at the beginning of each semester, ensure that the DHH students were seated near the faculty member (Al-Rayes, 2008; Hadjikakou et al., 2005; Hanafy, 2018; Lang, 2002).

The presence of coordinators was another educational factor that was used. This factor usually includes special supervisors who visit the institutions depending on the needs of DHH students. They share their knowledge with faculty members and discuss problems of DHH students (Hadjikakou et al., 2005) as well as conduct Regular assessment, and provide DHH students with the necessary academic instructions (Al-Rayes, 2008). In addition, this refers to the supervisory arrangement of a higher authority in the form of special departments and units in universities, in which certain qualified individuals are appointed to supervise the learning process of DHH students. This supervision is often under the management of the university's support service office.

Furthermore, the note-taking is an important service for the DHH students because it summarizes information during lectures by qualified personnel. This service often helps DHH students to reorganize and fill in missing information after completing a lecture (Stinson, Elliot, & Kelly, 2017). According to Lang (2002) one of the challenges that the DHH students face in lectures is multiple visual tasks, such as focusing on translators and faculty member in the same time, which makes it difficult for these students to take notes. This is confirmed by Hanafy (2018) who stated that the DHH students in Saudi universities faced difficulty when they write notes and read lips of a faculty member at the same time.

1.3. Teaching Expertise in Higher Education for DHH Students

The purpose in this part is to review research theorizing of the teaching expertise. Expertise in university teaching has usually been defined as a set of educational practices that help students to achieve better results other than methods of traditional teaching (Wieman, 2019). There are also development of methods for eliciting expert knowledge and organization in specific areas (Wieser, 2020). It is important to understand the teaching expertise that is feasible to be developed in the work environments (Ropo, 2004). The expertise may be viewed from the intelligence or abilities that are developed through experience and interaction with the environment in addition to the role of acquired knowledge (Wieman, 2019). Thus, the context of work plays a key role in guiding or influencing a person's development in the field of expertise. According to Ropo (2004) the development of expertise requires more than ten years of experience in full-time work. However, it is difficult to explain how teaching expertise influences achievement because not all the students whose achievements are excellent must have expert teachers.

In universities, Wieman (2019) has shown that the effects of teaching are dominant, affecting the students' academic achievement among other factors. According to Kali, Sagy, Benichou, Atias, and Levin-Peled (2019) standards that are related to the expert faculty is associated with the outcome measures such as the student's achievement. Thus, an expert teacher is well-versed in identifying and implementing appropriate strategies (Leko, Brownell, Sindelar, & Murphy, 2012). Therefore, a major conclusion is that teaching expertise makes a difference in the student's achievement. Conversely, insufficient expertise in teaching has been one of the main difficulties (Sun & Huang, 2016). Many previous studies have indicated that inexperienced teachers are typically less effective (Wieman,

2019). Consequently, the success of university DHH students is highly dependent on the knowledge and experience of their teachers (Marschark, Shaver, Nagle, & Newman, 2015; Mwanyuma, 2016).

Additionally, the teaching expertise appears through the implementation of strategies that are related to educational services (Kali et al., 2019; Verma, Stoffova, & Zoltán, 2018). For example, making necessary changes to grading standards, slowing the pace of teaching, allowing more time for testing, and offering DHH students an alternative test when needed (Al-Fangary, Mostafa, & Al-Harbi, 2019; Al-Rayes, 2008). More so, faculty members also need to use their expertise in technology proportional to the DHH students' needs (Omar, 2014). It is important to emphasize that the faculty members' knowledge of technology cannot be separated from their teaching experience and content because they are strongly related to learning considerations (Omar, 2014). This means that the technology cannot be addressed independently due to the effect of technology use on other educational tasks (Chepsiror, 2021; Kali et al., 2019).

In Saudi universities, one of the obvious shortcomings is the lack of researches on the expertise of faculty members who are working with DHH students (Al-Ajlan, 2017). It is important for faculty members who are teaching DHH students to know how the technologies support the educational needs of DHH students (Salem, 2017). The experiences, background, and knowledge of the faculty members are very important in the lectures because they need to treat, understand, and use technologies as well as teaching aids such as a whiteboard, textbook, and marker pen (Chong & Shaffe, 2015). In this study, different aspects of teaching expertise were measured: Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical and Content Knowledge (TPACK).

1.4. Academic Achievement of DHH Students in Higher Education

Issues regarding factors that may affect the academic success of DHH students are considered as the most important topics addressed by a number of researchers in the past years (Crowe, Marschark, Dammeyer, & Lehane, 2017). According to Qi and Mitchell (2012) the achievement of DHH students is still far behind their hearing peers despite promising developments in their education. This underscores the need for educational adjustments and support factors. Providing the support for DHH students in higher education helps them to address barriers that may affect their academic success (Lang, 2002).

Marschark et al. (2015) confirmed that the academic achievement of DHH students is the result of an interaction of many different factors such as the family environment, the level of education of parents, the language abilities of DHH students, their experiences inside and outside the school, and additional disabilities. According to Marschark et al. (2015) up to 40% of DHH students may also have additional disabilities that affect academic outcome. Moreover, an important part of the success of DHH students in secondary and higher education is to acquire better language and academic skills in elementary school, which means early access to education and language (Crowe et al., 2017). According to Al-Rayes (2008) early intervention and academic preparation in primary and secondary programs have a direct impact on the academic achievement of DHH students in higher education.

Educational factors are among the most important because they make a difference in the DHH students' achievement (Hanafy & Al-Saleh, 2018) and this difference is also related to expertise in teaching. The expertise in teaching has a stronger influence on the student's achievement compared to other factors (Darling-Hammond, 2000) and the influence for DHH learners is more salient (Peng & Daud, 2015). According to Hanafy and Al-Saleh (2018) the success of DHH in universities is based on many factors such as curriculum, methods of teaching, administration, as well as faculty members.

1.5. Aims of the Present Study

The main aim of the current study is to investigate whether teaching expertise significantly mediates the relationship between educational factors and academic achievements of DHH students in Saudi universities.

Moreover, this study's aim is to provide current evidence on the relationship between educational factors (MCD, PC, and NTS), and the relationship between teaching expertise (PK, PCK, TPK, and TPACK), and the academic achievements of DHH students in Saudi universities. The current study also aims to examine the relationship between educational factors and teaching expertise. The study also seeks to examine the underlying factors of educational factors and teaching expertise constructs. Accordingly, this study framed the following research hypotheses to achieve all these objectives:

Hypothesis 1 (H1): The measure of the multidimensional nature of educational factors and teaching expertise are valid and reliable.

Hypothesis 2 (H2): The educational factors and teaching expertise are directly and significantly related to the DHH students' academic achievement in Saudi universities.

Hypothesis 3 (H3): The educational factors are directly and significantly related to the teaching expertise in Saudi universities.

Hypothesis 4 (H4): The teaching expertise plays a mediating role in the relationship between the educational factors and the DHH students' academic achievement in Saudi universities.

2. THEORETICAL FOUNDATION

2.1. Literature Review

One of the academic challenges that DHH students face in higher education is access to information and discussions in the classroom (Lang, Biser, Mousley, Orlando, & Porter, 2004; Liversidge, 2003; Stinson et al., 2017) especially if spoken language is dominant (Cawthon, Schoffstalll, & Garberoglio, 2014). Therefore, it is important to provide note taking service for DHH students (Stinson et al., 2017). Furthermore, there must be flexibility in the teaching methods in the lectures to meet the academic requirements of DHH students (Al-Fangary et al., 2019) which includes giving DHH students equal opportunities to ask questions (Braun et al., 2018) and sitting close to the faculty member during the teaching (Lang et al., 2004).

A study by Hadjikakou et al. (2005) on DHH students and their teachers at secondary general schools in Cyprus, suggested the necessity of modifying the classroom through modifying the curriculum, modifying the content of lessons when needed, reducing the amount of lessons, clarifying the language of the curriculum, reducing tasks, giving additional tests when needed, speaking clearly and slowly by teachers, and, in addition, introducing new methods and visible educational aids. In a similar study, Mwanyuma (2016) examined the curricular factors, language of instruction, and availability of educational resources that could affect the academic achievement of DHH students in Kenya from the perspective of one head teacher, 37 teachers, and 8 parents. To collect data, the researcher used questionnaires and interviews. The results showed that there is a strong correlation between curriculum difficulty, simplified language of instruction, lack of learning resources, and DHH students' academic achievement.

Regarding the note-taking service, Lang (2002) indicated that the note-taking is essential for most DHH students in colleges because they often rely on a third party to provide access to information in lectures. Besides, Liversidge (2003) confirmed that the note-taking service helped DHH students in obtain a higher academic rate. According to Saunders (2012) support factors vary greatly from one education center to another, resulting different academic outcomes for DHH students. For example, some DHH students at universities receive support from note-takers in lectures, while others universities offer explanation for the lectures in the resource room.

In some cases, taking notes is a difficult task for many DHH students due to the challenge of attending to multiple visual tasks (Lang, 2002). According to Spradbrow and Power (2004) DHH students at Australian universities lose information during lectures, especially the note-taking being a difficult task for some DHH students. Moreover, Hastings et al. (1997) mentioned many of the limitations associated with this service such as differences in the quality of notes and exclusion of important information because the note-takers may not appreciate its importance.

There are other factors that may have an impact on the achievement of the DHH students in universities such as the teaching expertise of faculty members. Several researchers have discussed the teaching expertise of university faculty (e.g., (Wieman, 2019; Wieser, 2020)). Wieman (2019) results confirmed that the faculty members' training and years of experience had a positive impact on student outcomes. Additionally, previous research has indicated that students generally had better outcomes when they were taught by experienced teachers (Kali et al., 2019; Ropo, 2004; Wieman, 2019; Wieser, 2020).

Among the studies that addressed the support factors and teaching expertise for students with disabilities was a study by Sun and Huang (2016) which emphasized that teaching expertise in schools had a direct impact on support factors such as educational adjustments in the classroom. On the Saudi side, a few researchers have made attempts to search about the teaching expertise and the development of teaching performance in general and university education (e.g., (Al-Salhi, 2013; Hasanatu, 2020)). To the best of this researcher's knowledge, no study has directly measured teaching expertise in higher education programs for DHH students in Saudi universities.

To understand the psychological and communicative factors that may prevent DHH student' participation, greater professional development efforts for college and university professors and more collaboration between professors and support providers is needed (Lang et al., 2004). Faculty members should be aware of the educational needs and challenges of DHH students (Cromeenes, 2019). Therefore, it is possible for faculty members to benefit from the service provided by the coordinators in their regular visits. For instance, coordinators can closely monitor the effectiveness of DHH student' support factors, assist faculty members in their work by teaching small groups of DHH students, while faculty can train them to learn the appropriate teaching strategies (Hadjikakou et al., 2005; Lang, 2002).

Furthermore, many of previous studies searched about TPACK for teachers of DHH students. Peng and Daud (2015) collected information and data from books, journal articles, thesis, dissertations, and conferences on special education TPACK, especially for teachers of DHH students. Chong and Shaffe (2015) conducted a study that aimed to investigate perceptions of content, technology, and pedagogy among Malaysian teachers in elementary special education schools for DHH students. In addition, Peng and Daud (2016) conducted a quantitative study to examine the professional knowledge of special education teachers. The results showed that these teachers perceived high confidence in their content and teaching methods with DHH students.

After going through English and Arabic databases, the official Saudi Digital Library (SDL), journals articles, Master's theses, and PhD dissertations, most of the previous Saudi studies have focused on support services in general for students with disabilities in Saudi universities (Aqeel & Bakri, 2018). For instance, numerous studies have examined the support factors for undergraduate students with disabilities (Al-Wabli, 2001; Al-Wabli & Binomran, 2018; Aqeel & Bakri, 2018) including DHH students (Hanafy & Al-Aydy, 2016; Hanafy & Al-Saleh, 2018). Most of the studies have concentrated on faculty attitude and Knowledge towards DHH students at universities (Al-Ajlan, 2017). In short, the literature on this topic is quite limited.

Hanafy and Al-Saleh (2018) conducted a study aimed at identifying the personal and educational factors that may affect the academic performance of DHH students in universities in Riyadh and Al-Kharj. The results showed that the DHH students were in agreement with the effects of educational factors on academic achievement. Likewise, Al-Wabli and Binomran (2018) brought up an important point: the provision of academic and educational factors in comprehensive environments guarantees a maximized access to the benefits of higher education programs for students with disabilities. Moreover, Al-Ajlan (2017) conducted a quantitative study to investigate similarities and differences in the attitudes and knowledge of 224 faculty members towards DHH students at the AOU. The results showed that the teaching experience had a significant impact on the knowledge and attitudes of the faculty members, and they had sufficient knowledge of hearing loss, in addition to their positive attitudes towards these students in higher education.

2.2. Conceptual Framework

The conceptual framework of this study is based on the current version of the Bronfenbrenner's bio-ecological systems theory by Bronfenbrenner (1977) which is a simplistic model created in 1974. This theory is related to the concept of disability because it focuses on the interactions between the individual and the environment (Bronfenbrenner, 2005) especially with the adding of the (bio) aspect that is closely related to the case of disability in inclusion (Bell, 2013). Ling (2010) has discussed the impacts of the ecosystem, mesosystem and microsystem on the participation of students with disabilities in colleges and universities. The current study used this theory because the educational factors that have been identified through this study can be explained under all the systems of the Bio-system theory, which helps to understand the problems that are related to education (Bronfenbrenner, 2005). This theory also helped to explain how institutional and educational factors and services in universities are likely related to the academic achievement of DHH students (Bell, 2013).

Moreover, the conceptual framework of this study was based on Technology, Pedagogy, Content and Knowledge (TPACK) Framework. TPACK is a specialized type of knowledge that focuses on the teachers' knowledge of curriculum content, techniques, and effects on learning (Mishra & Koehler, 2008) and this framework traces back to Shulman (1986) seminal paper. Therefore, teaching expertise can be identified by TPACK review, which relates to knowledge that comes from the faculty's understanding of many areas, such as knowledge, learning context, and technology (Peng & Daud, 2015). TPACK was considered suitable for this study because it helps to measure the different aspects of teaching expertise that are relevant to this study which are (PK, PCK, TPK, and TPACK).

In addition, the conceptual framework of this study focused on independent and dependent variables, as well as a mediating variable. The independent variable is the educational factors, while the dependent variable is academic achievement, which is measured by CGPA. In addition, teaching expertise is considered as a mediating variable in the relationship between educational factors and academic achievement of the DHH students in Saudi universities.

Furthermore, this study focused on the relationship between educational factors and DHH student's achievement in universities. According to Adkins (2020) the educational factors are the multiple academic services that are provided to the DHH students in order to help them to learn efficiently in proportion to their needs (Hanafy & Al-Aydy, 2016). Moreover, the educational factors contribute to improve the academic scores of the DHH students at institutions of higher education (Cawthon et al., 2014). In this study, the educational factors have been divided into (MCD, PC, and NTS). These factors have been classified in this way based on several previous studies, such as Hadjikakou et al. (2005); Braun et al. (2018) and Lang (2002).

In the Saudi side, experts have pointed out that there is still a lack of investigation into the mediating effect of teaching expertise on the relationship between educational factors and academic achievement of DHH students in Saudi universities. In addition, there is a dearth of research on the effectiveness of support systems and the available support services for DHH students, including note-taking (Hanafy, 2018). Therefore, more research is needed to raise the understanding of the problems that DHH students are faced with, and how they can be overcome.

3. METHODOLOGY

3.1. Instrument

This study applied a quantitative research design using a questionnaire that was divided into three main sections to address the hypotheses that were proposed for the current study. Specifically, the first section dealt with the student demographic information of the DHH students, which included gender, university, year of study, hearing status, communication method, and current CGPA. For the CGPA, the DHH students were asked to write their current CGPA, and this was used to measure their academic achievement. The main grading system that was used by institutions of higher education in Saudi Arabia is out of a 5.0 grading scale, where it should be between 1 and 5. As such, the maximum academic achievement presented in the current study was 5.0 and the minimum 2.15. The mean score of students' academic achievement by using a CGPA was 3.905 and a standard deviation of 0.5761.

The second section consisted of items covering the educational factors, which were divided into three domains: (B1) MCD, (B2) PC, and (B3) NTS. It contained 25 items. Domain (B1) was designed to measure the relationship between modified classroom delivery and academic achievement of DHH students in Saudi universities; this domain contained 14 items. Domain (B2) was designed to measure the relationship between presence of coordinators and the DHH students' academic achievement; this domain contained 6 items. The final domain in this section was (B3), which was designed to measure the relationship between note-taking service and the academic achievement of DHH students, and it contained 5 items. All the items were adapted from Lovejoy (2016); McLennan et al. (2014) and Stewart and Crane (2019).

As for the third section, it consisted of items covering the teaching expertise, and were divided into four domains: (E1) PK, (E2) PCK, (E3) TPK, and (E4) TPACK. It contained 24 items. Domain (E1) was designed to measure the (PK) of faculty members who were working with DHH students in Saudi universities; this domain contained 6 items. Domain (E2) was designed to measure the (PCK); this domain contained 7 items. Domain (E3) was designed to measure the (TPK) with 4 items. The final domain was (E4), which was designed to measure the (TPACK) with 7 items. All the items were adapted from Barisic, Divjak, and Kirinic (2017); Castéra et al. (2020); Schmidt et al. (2009) and Valtonen et al. (2017).

All items on the questionnaire were measured using a five-point Likert scale, where (1) represented 'strongly disagree', and (5) was 'strongly agree'. These questionnaires were completed by the undergraduate DHH students in Saudi universities in order to achieve this study's objectives. A total of 298 usable questionnaires were received and analyzed using the covariance-based structural equation modelling (SEM) via AMOS software (version 24).

3.2. Participants and Sampling Method

The data of the current study was collected during the second semester of the academic year 2019/2020 from the Saudi undergraduate DHH students in public and private Saudi universities. The study population included DHH students who had enrolled full-time, whether in the first, second, third, or fourth year in Saudi universities. After obtaining the information that was related to these programs from the MOE, there were only two Saudi universities that offered undergraduate programs for DHH students to obtain a bachelor's degree, namely, King Saud University and the Arab Open University.

The total number of male and female DHH students in these two universities reached 385. All participants in this study had switched to online learning because of the COVID-19 pandemic. For that, the researchers worked with a deaf person who holds a Master's degree in deaf education to make videos by using Saudi Sign Language for each item of the online questionnaire. To achieve the ethical objective, DHH students were informed that their identity would not be disclosed and that their information was confidential. For data collection, the researchers also obtained approval from the MOE in the KSA.

Based on Krejcie and Morgan (1970) the sample size was 191. As for online (Raosoft, 2011) the sample size was 298. Researchers decided to choose Rao soft calculator so that they can obtain adequate data and make appropriate generalizations (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014). Also, simple random sampling was the technique that was used to select target participants.

The researchers asked the administration office in both universities for lists of undergraduate DHH students during the 2019/2020 academic year. These lists included name, matric number, and mobile number, and each student was assigned with a sequential number starting with 1, 2, 3, ...etc. Then, the researchers randomly selected the sample from these sequential numbers. After that, the researchers sent the questionnaire to each student whose number was chosen through mobile messages. For the analysis, a total of 350 questionnaires were distributed. A total of 305 questionnaires were returned, and 7 questionnaires were rejected due to outliers. Therefore, there were only 298 usable questionnaires which represented the sample number that was selected.

4. DATA ANALYSIS AND RESULTS

4.1. Preliminary Data Analysis and Data Preparation

Prior to analysis, SPSS version 26 was utilized for data preparation, while AMOS 24.0 was used to determine the study model's fit as well as statistical analysis of the data obtained. The researchers took some important steps to validate this study. To begin, the initial edition of the questionnaire was delivered to special education professionals, and their comments and observations were taken into account. Second, the original English questionnaire was translated into Arabic because the majority of the participants in this study were Arabic speakers. Any errors in the translation of the questionnaire had to be avoided in order to ensure the validity of employing this questionnaire in multiple languages. Moreover, there are several directions on which language should be utilized while drafting questionnaire items (Chua, 2016).

One of the main important rules is to employ back translation in order to ensure that the language that is used is the same as the participants' mother tongue. Therefore, some steps were taken to complete the questionnaire's back-translation process, including consulting with specialized translators with special education backgrounds. In terms of reliability, the overall Cronbach for the variables was above 0.70, indicating a good level of dependability and emphasizing the questionnaire's validity in achieving the goals. In addition, these findings demonstrated that the multiple correlation values for each questionnaire item reflected a reasonable standard of correlation.

4.2. Demographic Characteristics

Table 1 presents the demographics characteristics of the DHH students in Saudi universities who participated in the current study. The first characteristic is the gender of the students; as shown in the table: 53.4% of the participants are males while 46.6% are female DHH students. Regarding the university where they are from, 56% are from King Saud University while 44% are from Arab Open University. With regard to their year of study, there was no significant difference between the numbers of participants because the findings of the study have revealed a similar variation between the respondents from each group. Regarding the hearing status of the DHH students, almost the same number comes from each group with 50.3% who is deaf, and 49.7% who are hard of hearing. Lastly, sign language and oral method were the most common communication method among DHH students in Saudi universities.

Table-1. Summary of demographic information of questionnaires participants.

Variable	Group	Percentage %
Gender	Male	53.4
	Female	46.6
Institution Studying in	King Saud University	56.0
	Arab Open University	44.0
Year of study	First year	26.5
	Second year	23.5
	Third year	24.5
	Fourth year	25.5
Hearing status	Deaf	50.3
	Hard to hear	49.7
Communication Method	Saudi sign language	8.1
	Oral method	18.8
	Sign language and oral method	73.2

Note: N=298.

SEM was used to evaluate the measurements of teaching expertise (PK, PCK, TPK, TPACK) and educational factors (MCD, PC, NTS), as well as to investigate the direct and mediating relationship between the educational factors, teaching expertise and the academic achievement of the DHH students in Saudi universities using the AMOS (version 24) model-fitting program. To verify the adequacy of this model, both the measurement and structural models were used by the researchers. The covariance matrix was produced from the data used to estimate the

postulated models. As a result, the estimating processes satisfied the underlying statistical distribution theory, giving defensible property estimates.

4.3. Analysis Procedures

4.3.1. Measurement Model of Teaching Expertise and Educational Factors

The educational factors and the teaching expertise measurement model which can be referred to as Confirmatory Factor Analysis (CFA) was conducted to examine the construct validity and reliability of the model dimensions. The current study used a series of indicators that had to be compared to the model fit result in order to ensure that it was accurate. The chi-square (X2), degree of freedom, comparative fit index (CFI), Tucker-Lewis index (TLI), and root-mean-square error of approximation were the indices used (RMSEA). The chi-square (X2) value should have been.5, and the RMSEA value should have been.08, and CFI and TLI should have been >.90 (Hair, Black, Babin, & Anderson, 2013; Kline, 2015). For this reason, the measurement model for the model of study was revised by using modification indices. Figure 1 reveals that the CFA has indicated an acceptable fit with chi-square (X²) = 1655.401, degree of freedom (DF) = 852, RMSEA = 0.056, CFI = 0.952, and TLI = 0.949.
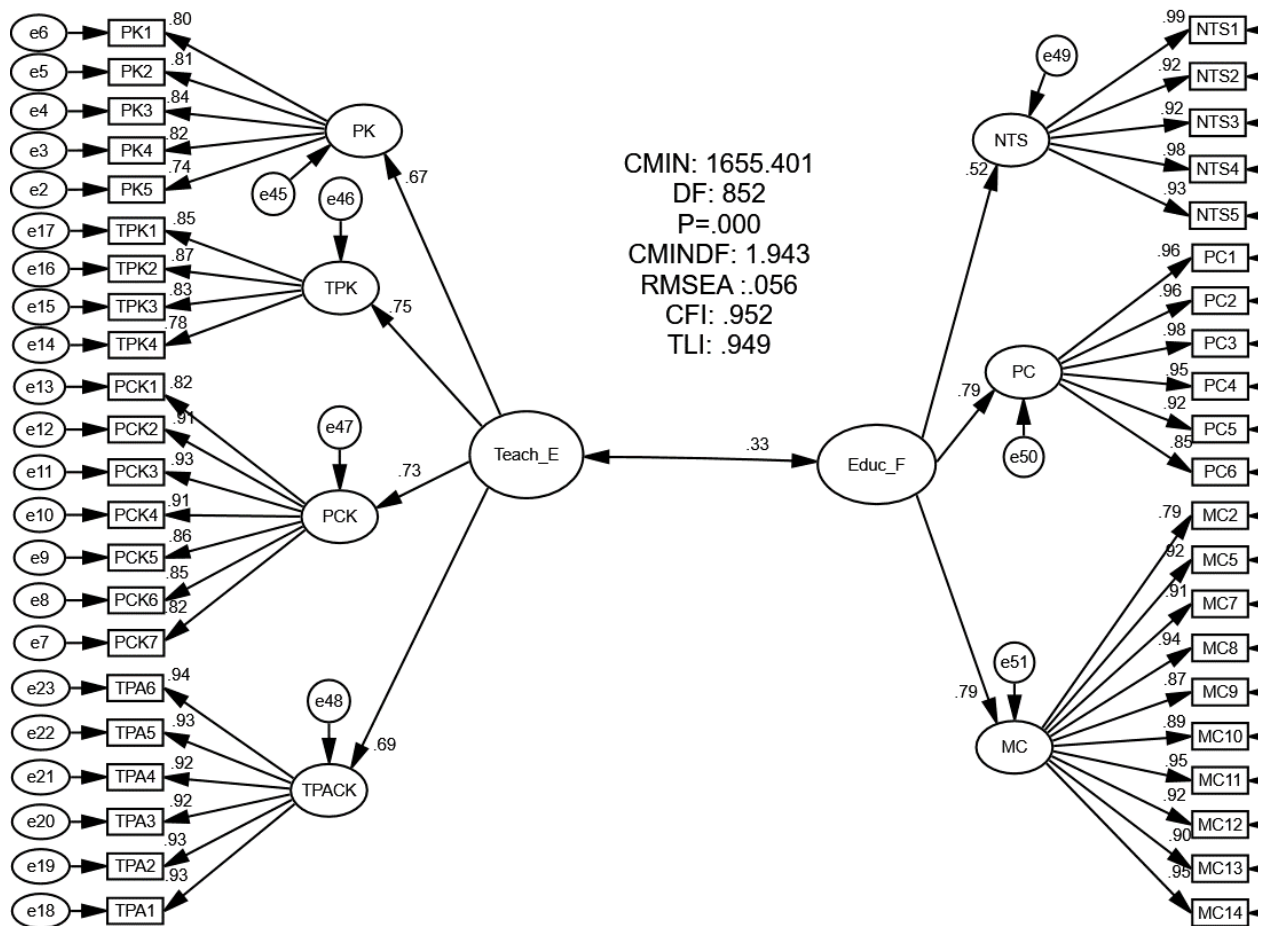

Figure 1. Confirmatory factor analysis results.
Note: (MCD) Modified Classroom Delivery, (PC) Presence of Coordinators, (NTS) Note Taking Services, (PK) Pedagogical Knowledge, (PCK) Pedagogical Content Knowledge, (TPK) Technological Pedagogical Knowledge, and (TPACK) Technological Pedagogical and Content Knowledge.

As a result, four items from the educational factors (MC1, MC3, MC4 and MC6), as well as two items from teaching expertise (PK6 and TPACK7) were removed from the list since they did not match the requirements. Table 2 lists all of the items. More evidence for the hypothesized model's validity and suitability as a measurement model for technical aspects are discussed in this section.

Table 2. Items of the model.

Construct	Sub-Construct	Items	Loading	S.E.	C.R.	CR	AVE
Teaching Expertise	Pedagogical Knowledge	PK1	0.794			0.795	0.660
		PK2	0.788	0.066	15.380		
		PK3	0.524	0.075	16.139		
		PK4	0.691	0.069	15.456		
		PK5	0.731	0.073	13.705		
	Pedagogical Content Knowledge	PCK1	0.930	0.066	16.939		
		PCK2	0.798	0.065	19.796		
		PCK3	0.813	0.061	20.537		
		PCK4	0.845	0.065	20.051		
		PCK5	0.816	0.068	18.232		
		PCK6	0.743	0.062	17.793		
		PCK7	0.921				
	Technological Pedagogical Knowledge	TPK1	0.926	0.063	15.747		
		TPK2	0.913	0.064	16.231		
		TPK3	0.861	0.066	15.385		
		TPK4	0.847				
	Technology Pedagogy and Content Knowledge	TPACK1	0.906				
		TPACK2	0.784	0.036	30.359		
		TPACK3	0.829	0.035	29.323		
		TPACK4	0.867	0.037	29.609		
		TPACK5	0.845	0.036	30.289		
		TPACK6	0.930	0.036	31.686		
Educational Factors	Modified Classroom Delivery	MC2	0.924			0.751	0.509
		MC5	0.930	0.070	19.428		
		MC7	0.941	0.065	18.900		
		MC8	0.820	0.065	19.544		
		MC9	0.816	0.074	17.451		
		MC10	0.788	0.067	18.126		
		MC11	0.928	0.065	20.023		
		MC12	0.911	0.067	19.316		
		MC13	0.931	0.069	18.554		
		MC14	0.861	0.065	20.262		
	Presence of Coordinators	PC1	0.885				
		PC2	0.946	0.026	39.099		
		PC3	0.924	0.022	44.297		
		PC4	0.899	0.026	37.343		
		PC5	0.954	0.030	31.995		
		PC6	0.956	0.037	25.058		
	Note Taking Service	NTS1	0.956				
		NTS2	0.975	0.025	37.877		
		NTS3	0.948	0.026	37.442		
		NTS4	0.917	0.016	62.725		
		NTS5	0.855	0.025	39.209		

In this section, the researchers discussed the convergent construct validity and divergent construct validity, as well as the measurement model's two types of construct validity. The first indicator of this stage was the examining all of the elements that reveal that all loadings were more than 0.70. According to Hair et al. (2014); Byrne (2013) and Kline (2015) the factor loadings for the items are acceptable in this scenario with an adequate sample size of participants. As a result, there was sufficient evidence of the measuring model's convergent construct validity because

all indictors in this study were related to their variables. As shown in Figure 1, the correlation between the two dimensions is less than 0.85 in terms of divergent construct validity. Therefore, both of these variables in this investigation supported the discriminant validity and the discriminant validity was shown to be valid (Hair et al., 2014). Lastly, the findings showed that the study model was psychometrically valid in general.

4.3.2. Adequacy of the Hypothesized Structural Model

After establishing the study model's psychometric qualities, the structural model was used to investigate the direct relationship between the educational factors, teaching expertise and the academic achievement of the DHH students, and the direct relationship between the educational factors and teaching expertise, as well as the mediating role of the teaching expertise on the relationship between educational factors and the DHH students' academic achievement (see Figure 2).

In this step, the initial research hypothesis was addressed. Following the successful construction of the measurement model as the structural model, this phase was deemed as the second stage of AMOS analysis. This model's anticipated causal links were consistent with the data (normed chi-square = 1.924; RMSEA =.056; CFI =0.951; TLI =0.948 and IFI=0.951).

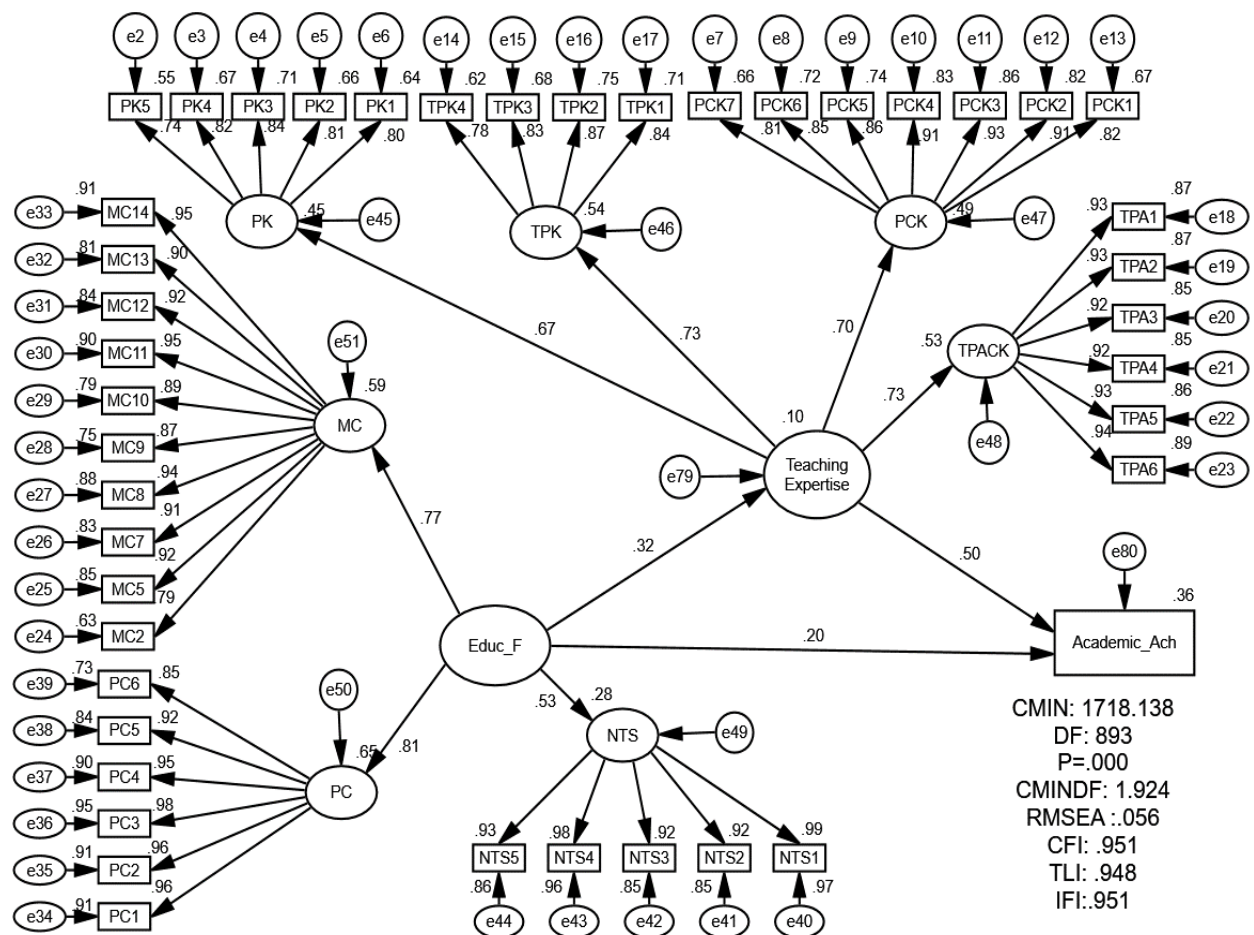**Figure 2.** Structural model of the study4.3.3. analysis of the direct hypotheses.
Note: (MCD) Modified Classroom Delivery, (PC) Presence of Coordinators, (NTS) Note Taking Services, (PK) Pedagogical Knowledge, (PCK) Pedagogical Content Knowledge, (TPK) Technological Pedagogical Knowledge, and (TPACK) Technological Pedagogical and Content Knowledge.

Figure 2 presents the results of the final structural model with the standardized path coefficients. The results of the model suggest that 36% of the variance of academic achievements of the DHH students in Saudi universities is explained by the determinants of the educational factors and teaching expertise. The paths in Figure 2 indicate that

educational factors and teaching expertise do positively relate to the academic achievements of DHH students in Saudi universities (β = 0.201, $p < 0.01$) and (β = 0.501, $p < 0.01$) respectively. The educational factors also have a direct relationship with teaching expertise (β = 0.323, $p < 0.01$). Hence, the three direct hypotheses of the research were supported by the model. Table 3 presents the results of the direct hypotheses.

Table 3. The direct hypotheses.

Structural Path		β (>0.2)	C.R (>0.196)	P-value	Decision
H1	EF →AA	0.201	3.216	0.001	Supported
H2	TE →AA	0.501	7.273	0.000	Supported
H3	EF →TE	0.323	4.107	0.000	Supported

4.3.3. Analysis of the Mediating Effect of Teaching Expertise

The significance test of the mediating role of teaching expertise in the relationship between the educational factors and the academic achievement of DHH students in Saudi universities was done by using a bootstrapping method based on methodological recommendations. Particularly, a bias-corrected bootstrap technique was employed using 1,000 bootstrap samples and confidence intervals of 95%. The bootstrapping procedure outcomes are shown in Table 4. These results indicate that the mediating paths of teaching expertise has been found to be statistically significant at the level lower than 0.01.

Table 4. Bootstrap results: Standardized indirect effect.

Path/effect		β	SE	95% Interval of Confidence		p-value	Decision
				Lower	Upper		
H4	EF → TE → AA	0.341**	0.047	0.266	0.420	0.002*	Supported

Note: (*) Statistically Significant.
(**) Practically Important.

5. DISCUSSION

The study's first aim was to determine and validate the psychometric properties of two multidimensional constructs, i.e., teaching expertise and educational factors in terms of their reliability, convergent validity and discriminant validity. As such, the results from the confirmatory factor analysis (CFA) pointed out a psychometrically sound model that had been hypothesized for the teaching expertise and educational factors. In other words, the current study offers empirical evidence that the teaching expertise and educational factors is a valid and reliable multidimensional construct, as has been implicitly hinted and documented in earlier works (Barisic et al., 2017; Braun et al., 2018; Castéra et al., 2020; Hadjikakou et al., 2005; Lang, 2002; McLennan et al., 2014; Schmidt et al., 2009; Stewart & Crane, 2019; Valtonen et al., 2017). While the educational factors are three dimensional, i.e., MCD, PC, and NTS, the teaching expertise on the other hand comprises four dimensions, i.e., PK, PCK, TPK, TPACK. Moreover, researchers should avoid using and interpreting both educational factors and teaching expertise as unidimensional constructs because they are confirmed to be of a multidimensional construct.

The second objective was to examine the direct relationship between the educational factors, the teaching expertise and the students' academic achievement. The results from the structural model showed that both the educational factors and teaching expertise were found to have positive and significant relationship with the academic achievement of DHH students in Saudi universities. This result supports the researchers' hypotheses that educational factors and teaching expertise are significant predictors of the DHH students' academic achievements in Saudi universities. As a result, the findings from the present study support previous research in this field (Adkins, 2020; Al-Fangary et al., 2019; Bell, 2013; Cawthon et al., 2014; Hanafy & Al-Saleh, 2018; Leko et al., 2012; Mwanyuma, 2016). Accordingly, the change in the educational factors and teaching expertise resulted in an improvement in the students' academic achievement. Furthermore, it has been determined that the educational factors and teaching expertise can

also affect what the students see as being significant in their academic achievement; they are likely to perform positively when better educational environment and teaching expertise are offered in the Saudi universities.

The third objective was to examine the direct relationship between educational factors and teaching expertise. The findings indicated that the educational factors have positive and significant related to the teaching expertise of the faculty members in Saudi universities. This result was despite the fact that the needs of the faculty members differ from the needs of the DHH students (Smith & Andrews, 2015). This is consistent with the results of Bell (2013) and Sibley et al. (2017) which indicated that the services and student support have an effect on the teachers and their expertise. This type of relationship emphasizes the importance of support factors not only for the success of DHH students, but also for the development of the teaching expertise of faculty members. This means that the support factors help the faculty members to be effective and to achieve the desired goals from higher education by developing their teaching expertise.

The fourth and last objective of the present study was to test the mediating role of teaching expertise in the relationship between educational factors and academic achievements of DHH students in Saudi universities. Bootstrapping analysis using AMOS 24 showed statistically significant mediating effect for the teaching expertise in the relationship between these two variables. In other words, the educational factors were found to have an indirect effect on the students' academic achievement through the teaching expertise. This finding was supported by Ruppar, Roberts, and Olson (2015) who observed that teaching expertise was the mediating factor that was able to effectively link students with disabilities between their education and academic achievements. Thus, this result supports the researchers' hypotheses that teaching expertise mediates the relationship between educational factors and the academic achievement of DHH students in Saudi universities.

Established upon the aforementioned discussion, it can be concluded that having a conducive educational environment in the Saudi universities, particularly classes for DHH students as well as better teaching expertise could lead to better academic achievement of DHH students in Saudi universities. In other words, whenever DHH students have better educational requirements and teaching expertise including the lecturers' knowledge, skills and innovation during their study, they are likely to put forth their best in their studies and achieve better academically. In effect, this study aims to generate an essential data in the field of educational environment, teaching expertise and the students' achievement, as there is a lack of studies focusing on the correlation between the exogenous variables, i.e., educational factors and teaching expertise, and the academic achievements- in particular among DHH students. More importantly the lack of studies in the mediating role of teaching expertise in the influence of educational factors on the students' academic achievement.

6. LIMITATIONS AND FUTURE RESEARCH

There are some limitations in this study. Firstly, the findings of this study may not represent all stages of education in KSA as this study focuses on universities that offer bachelor's degree for DHH students only. Therefore, further research into the same variants of this study should be conducted with larger samples of DHH students in all universities and colleges, as well as to cover all stages of general education in the KSA to bring a comprehensive insight. In addition, similar research might compare the responses and opinions of DHH students who are attending colleges compared to those who are attending universities. Secondly, this study was conducted for one special education category, and the results may not apply to other special education categories.

Thirdly, even though best efforts were made to gather adequate responses from DHH students at universities, the response of DHH students was low. With repeated attempts, the researchers were only able to obtain the required number of responses from the study sample. it was difficult to reach students due to the conditions related to COVID-19, as students were attending online courses at the time. Even with translating the questionnaire's items into Saudi sign language, it was difficult to get responses on time due to their preoccupation with the requirements of their

subjects. Therefore, future studies can explore the impact of e-learning on the academic achievement of DHH students during the COVID-19 period.

Fourthly, there was a lack of prior studies in Arabic on the teaching expertise of faculty members with DHH students in Saudi universities. Therefore, researchers were limited in being able to read and interpret English language studies. For this reason, it is important to conduct studies related to the teaching expertise of faculty members in higher education programs for DHH students in Arabic. Lastly, the research was written in English, although the subjects are Saudis who are well-versed in Arabic.

7. IMPLICATIONS AND RECOMMENDATIONS

The findings of the present study will be beneficial on both individual and organizational levels through its many practical implications that should be considered. First, this study verified the validity of the educational factors' questionnaire and highlighted the importance of these factors in raising the success rates. The model proposed in this study can be used as a validated model to assist higher education institutions in planning and creating more programs for DHH students. Second, it provides evidence for the MOE and higher education institutions about successful adoption of educational factors and teaching expertise and its relationship with academic achievement of DHH students in both universities and general education. Third, this study provides practical support for the mediating role of teaching expertise. To the best of the researchers' knowledge, this study is the first of its kind to test the mediating effect of teaching expertise on the relationship between educational factors and the academic achievement of DHH students in universities.

Additionally, program managers and policymakers can use the findings of this study as a guideline in organizing higher education programs for DHH students in Saudi universities and to develop effective plans to achieve desired long-term goals. Moreover, it will help increase the effectiveness of higher education programs for DHH students in Saudi universities by expanding the scope of provided educational services to achieve goals. Furthermore, this study sheds light on the factors that university administrations need to focus on in order to address the lack in infrastructure, which will contribute to higher student enrolment rates and improve the quality of education and achievement. Moreover, the results of this study will help the MOE to pay more attention to the important role of teaching expertise of faculty members through preparing and developing more courses and workshops for them.

Ultimately, as educational factors are the most important factors in determining the achievement of DHH students in universities, these factors should be provided and used by practitioners, educational and administrative staff, and faculty members to reach the desired educational goals. Thus, university management needs to focus on organizing and preparing programs by providing the necessary educational factors, providing DHH students with instructions and directions related to these factors, and conducting evaluations for the programs. In addition, clear work procedures should be set among the general supervisor, supervisors of support units, and faculty members.

Additionally, program administrators should pay more attention to the faculty member's expertise in teaching DHH students by providing appropriate workshops and courses to increase knowledge and skills in long-term required areas. Furthermore, faculty members should benefit from the results of this study in terms of modifying teaching methods and strategies, in addition to modifying the delivery of lectures to DHH students in accordance with the needs and characteristics of each student. Lastly, the findings and recommendations of this study should receive attention from the MOE, policymakers, decision-makers, supervisors, and faculty members because they are all responsible for developing higher education programs for DHH students in Saudi universities.

8. CONCLUSION

The academic success of DHH students is one of the most important issues that should be researched and addressed in sufficient depth by exploring the influencing factors (Mohammed, 2020). Therefore, it is important to investigate educational factors that are related to DHH students' academic achievement in order to solve problems

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and overcome difficulties. Accordingly, this study has been prepared specifically to examine the relationship between educational factors, teaching expertise and the academic achievement of DHH students in Saudi universities, as well as the relationship between educational factors and teaching expertise, taking into account the mediating effect of teaching expertise in the relationship between these factors and achievement.

The results indicated that there is a direct significant positive relationship between the educational factors, the teaching expertise and the academic achievement of these students. Therefore, these factors have an important role in enabling DHH students to achieve a high level of educational achievement. This means that the educational factors must be chosen and provided by university program administrators to increase the chances of success for those students. This result is supported by the results of previous studies which have shown the importance of educational factors in general on the learning outcomes of DHH students in higher education (Adkins, 2020; Bell, 2013; Bell & Swart, 2018; Cromeenes, 2019; Hanafy & Al-Saleh, 2018; Saunders, 2012; Williams, 2017). Also, Mwanyuma (2016) has confirmed that there is a strong correlation between the lack of learning resources and the DHH student's achievement.

Furthermore, this result was in line with the results of Wieser (2020) who have indicated that teaching expertise in universities has an important role in academic success for students. According to Ropo (2004) expert teachers are those whose students' academic achievement is at the required level. Thus, the main conclusion is that teaching expertise makes a difference in academic success (Wieman, 2019). Also, the results have pointed out that the educational factors positively and significantly affect the teaching expertise; this result is in line with the results of Bell (2013) and Sibley et al. (2017) which confirm that the student's support affects the expertise of the teachers.

Another important finding is that there was a mediating effect of teaching expertise on the relationship between educational factors and achievement. Accordingly, there is an indirect relationship between educational factors and DHH student achievement through teaching expertise in Saudi universities. This means that the teaching expertise of the faculty members in Saudi universities is very important in achieving the desired achievement. This is confirmed by Sniatecki, Perry, and Snell (2015) who have indicated that a high level of teaching expertise reflects a high level of student outcomes. Therefore, the faculty in universities who works with DHH students should have a very high level of knowledge, competencies, skills, and abilities. More so, faculty members should possess a special education qualification or at least have attended specialized and relevant special education workshops. In the Saudi context, no Saudi studies have been found that examine the mediating effect of teaching expertise on the relationship between educational factors and DHH students' academic achievement.

Indeed, more studies are needed regarding the effect of the different types of services and support factors on DHH students' achievements in higher education such as personal, psychological, and environmental factors. Also, this research is among the first steps in studying the teaching expertise as a mediating factor. Similar research on other mediating factors can bring in more interesting insights into these programs. Moreover, the teaching expertise in this study was measured by the TPACK framework. Therefore, it is possible for further research to measure the teaching expertise by different measurement models and criteria.

It is also possible to study the same variables in the context of the general education sector or even in colleges that offer diploma programs, especially since the model that is proposed in this study may apply to the entire education sector. Moreover, researchers in the future can study similar areas from different perspectives. Additionally, qualitative and quantitative research (mixed methods) can be conducted, as well as a qualitative study by interviews is needed to obtain more information regarding the effect of support factors on academic achievement of these students.

Furthermore, a similar study is possible for other categories of students with disabilities such as students with learning disabilities and blind students in order to generalize the results. In addition, since the model of this study was developed in the Saudi context, this questionnaire can be further tested in different countries. More so, it is

possible to conduct comparative studies to compare higher education programs for DHH students in Saudi universities with higher education programs in other countries.

In conclusion, educational factors play an important and critical role in the academic success of DHH students in the higher education programs in Saudi universities. Therefore, there is an urgent need to study the influence of teaching expertise and educational factors on the academic achievement of DHH students in universities, by considering the current situation. Additional research will provide valuable evidence to improve the DHH students' higher education programs, by examining the factors that affect their academic success. Finally, this research contributes not only to developing educational factors and teaching expertise in universities, but it will also encourage Saudi universities to benefit from the international experiences, and to establish specific goals that are appropriate for Saudi universities.

REFERENCES

Adkins, C. (2020). *The transition experiences of deaf and hard of hearing students into postsecondary education.* Doctoral Dissertation, Murray State University.

Al-Ajlan, M. (2017). *Knowledge and attitudes of faculty members at a Saudi university toward deaf and hard of hearing students in higher education.* Doctoral Dissertation, University of New Orleans.

Al-Fangary, H., Mostafa, W., & Al-Harbi, M. (2019). The reality of educational services provided for students with hearing disabilities at Kuwait university from point of view of Faculty. *Journal of the Faculty of Specific Education for Educational and Qualitative Studies, 3*(9), 164–195.Available at: http://doi:10.21608/SJSE.2019.58690.

Al-Hawi, M. (2015). The reality of using information and communication technology by teaching staff members and support staff in higher education program for deaf and hard of hearing-impaired persons at King Saud University. *The Arabian Gulf Message, 37*(139), 75–97.Available at: https://doi.org/10.35270/0011-037-139-004.

Al-Mousa, N. (2008). *The path of special education in the Kingdom of Saudi Arabia from isolation to integration.* Dubai, UAE: Dar Al Qalam Publishing and Distribution.

Al-Omary, B. (2018). Deaf perspectives on the Saudi Arabia vision 2030: Implications for the Saudi deaf community and how it can be used to empower the deaf. Deaf Unit Registered Charity. Retrieved from https://deafunity.org/article_interview/deaf-perspectives-on-the-saudi-arabia-vision-2030-implications-for-the-saudi-deaf-community-and-how-it-can-be-used-to-empower-the-deaf/.

Al-Rayes, T. (2008). Rehabilitation of deaf and hard of hearing students for higher education: Why? How? *Journal of Educational Sciences, 2*(6), 1125–1137.

Al-Rayes, R., & Al-Kharji, M. (2010). Reality and obstacles of higher education programs for deaf and hard of hearing students in Riyadh city. *Journal of the College of Education: Education and Psychology, 34*(4), 621–683.

Al-Salhi, A. (2013). Dimensions of subjective teaching effectiveness according to the level of teacher experience, specialization, and educational stage. *Journal of Arab and Human Sciences, 7*(1), 1–75.Available at: https://doi.org/10.12816/0009590.

Al-Wabli, A. (2001). The nature of the facilities, support services, and special programs that should be provided by higher education institutions to students with disabilities from the perspective of the faculty members. *Journal of King Saud University-Symposium on Higher Education, 8*(11), 193–294.

Al-Wabli, A., & Binomran, N. (2018). Supporting services and facilities provided to female students with disabilities at King Saud University and their obstacles from their perspectives. *Journal of Special Education and Rehabilitation-Special Education and Rehabilitation Foundation; Egypt, 6*(21), 1–26.Available at: https://doi.org/10.12816/0043617.

Al-Zahrani, A. (2015). Surveying academics' views about the rights of the deaf and hard of hearing and the services provided to them in the higher education program at King Saud University. *International Journal of Educational Research, 38*(5), 1–35.

Aqeel, O., & Bakri, S. (2018). The experience of disabled female students at academic study in Saudi universities. *Journal of Educational and Psychological Research, 15*(75), 52–75.

Barisic, K., Divjak, B., & Kirinic, V. (2017). *Validation of survey of preservice teachers' knowledge of teaching and technology in the context of Croatian educational system.* Paper presented at the Central European Conference on Information and Intelligent Systems, Faculty of Organization and Informatics Varazdin.

Battal, Z. (2016). Special education in Saudi Arabia. *International Journal of Technology and Inclusive Education, 5*(2), 880–886.Available at: https://doi.org/10.20533/ijtie.2047.0533.2016.0113.

Bell, D. (2013). *Investigating teaching and learning support for students with hard of hearing at a university in the Western Cape.* Doctoral Dissertation, Stellenbosch University.

Bell, D., & Swart, E. (2018). Learning experiences of students who are hard of hearing in higher education: Case study of a South African university. *Social Inclusion, 6*(4), 137–148.Available at: https://doi.org/10.17645/si.v6i4.1643.

Braun, D., Clark, M., Marchut, A., Solomon, C., Majocha, M., Davenport, Z., & Gormally, C. (2018). Welcoming deaf students into STEM: Recommendations for university science education. *CBE—Life Sciences Education, 17*(3), 1–8.Available at: https://doi.org/10.1187/cbe.17-05-0081.

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist, 32*(7), 513–531.Available at: https://doi.org/10.1037/0003-066x.32.7.513.

Bronfenbrenner, U. (2005). *Making human beings human: Bioecological perspectives on human development.* Thousand Oaks, CA: Sage.

Byrne, B. (2013). *Structural equation modeling with AMOS: Basic concepts, applications, and programming.* London: Routledge.

Castéra, J., Marre, C., Yok, M., Sherab, K., Impedovo, M., Sarapuu, T., & Armand, H. (2020). Self-reported TPACK of teacher educators across six countries in Asia and Europe. *Education and Information Technologies, 10*(10), 1–17.Available at: https://doi.org/10.1007/s10639-020-10106-6.

Cawthon, S., Schoffstalll, S., & Garberoglio, C. (2014). How ready are postsecondary institutions for students who are d/Deaf or hard-of-hearing? *Education Policy Analysis Archives, 22*(13), 1–25.Available at: https://doi.org/10.14507/epaa.v22n13.2014.

Chepsiror, P. (2021). Basic tenets of experiential learning in emergent reading activities in early childhood development and education Centres in Kenya: A comparison of public and private schools. *International Journal of Social Sciences Perspectives, 8*(1), 8–16.Available at: https://doi.org/10.33094/7.2017.2021.81.8.16.

Chong, A., & Shaffe, M. (2015). *Exploring elementary special education (hard of hearing) teachers' technological pedagogical content knowledge (TPACK).* Paper presented at the 1st International Conference on Special Education, Bangkok, Thailand.

Chua, Y. (2016). *Mastering research methods* (2nd ed.). Shah Alam, Selangor, Malaysia: McGraw-Hill.

Cromeenes, L. (2019). *Deaf or hard of hearing students' perceived value of services offered at Christian higher education institutions.* Doctoral Dissertation, Columbia International University. Available from ProQuest Central; ProQuest Dissertations & Theses Global. (27668957).

Crowe, K., Marschark, M., Dammeyer, J., & Lehane, C. (2017). Achievement, language, and technology use among college-bound deaf learners. *The Journal of Deaf Studies and Deaf Education, 22*(4), 393–401.Available at: https://doi.org/10.1093/deafed/enx029.

Darling-Hammond, L. (2000). Teacher quality and student achievement. *Education Policy Analysis Archives, 8*(1), 1–44.Available at: https://doi.org/10.14507/epaa.v8n1.2000.

Hadjikakou, K., Petridou, L., & Stylianou, C. (2005). Evaluation of the support services provided to deaf children attending secondary general schools in Cyprus. *Journal of Deaf Studies and Deaf Education, 10*(2), 203–211.Available at: https://doi.org/10.1093/deafed/eni020.

Hair, F., Sarstedt, M., Hopkins, L., & Kuppelwieser, G. (2014). Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European Business Review, 26*(2), 106–121.Available at: https://doi.org/10.1108/ebr-10-2013-0128.

Hair, J., Black, W., Babin, B., & Anderson, R. (2013). *Multivariate data analysis* (7th ed.). England: Pearson New International Edition. Pearson Higher.

Hanafy, A. (2018). Higher education for students with disabilities: Reality, requirements, and the role of support services for students with hard of hearing. *Journal of the College of Education, 30*(1), 240–253.

Hanafy, A., & Al-Aydy, G. (2016). Supportive services provided for deaf and hard of hearing students and their role in the quality of academic life in higher education programs in Riyadh. *Journal of Special Education and Rehabilitatio, 4*(13), 1–41.Available at: https://doi.org/10.12816/0031883.

Hanafy, A., & Al-Saleh, M. (2018). The effective factors of academic achievement for deaf and hard of hearing students in higher education institutions. *Journal of Special Education and Rehabilitation, 6*(26), 1–30.

Hasanatu, B. (2020). *A suggested scenario to activate the role of academic accountability in developing the performance of a faculty member in Saudi universities in the light of global experiences.* Doctoral Dissertation, King Abdullah bin Abdulaziz University at Kingdom of Saudi Arabia.

Hastings, D., Brecklein, K., Cermak, S., Reynolds, R., Rosen, H., & Wilson, J. (1997). Notetaking for deaf and hard of hearing students. A Report of the National Task Force on Quality of Services in the Postsecondary Education of Deaf and Hard of Hearing Students. NY: Northeast Tech- nical Assistance Center.

Kali, Y., Sagy, O., Benichou, M., Atias, O., & Levin-Peled, R. (2019). Teaching expertise reconsidered: The technology, pedagogy, content and space (TPACS) knowledge framework. *British Journal of Educational Technology, 50*(5), 2162–2177.Available at: https://doi.org/10.1111/bjet.12847.

Kline, R. (2015). *Principles and practice of structural equation modeling* (4th ed.). New York: The Guilford Press.

Krejcie, R., & Morgan, D. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, 30*(3), 607–610.Available at: https://doi.org/10.1177/001316447003000308.

Lang, H. (2002). Higher education for deaf students: Research priorities in the new millennium. *Journal of Deaf Studies and Deaf Education, 7*(4), 267–280.Available at: https://doi.org/10.1093/deafed/7.4.267.

Lang, H., Biser, E., Mousley, K., Orlando, R., & Porter, J. (2004). Tutoring in higher education: Perceptions of Deaf students, tutors and teachers. *Journal of Deaf Studies and Deaf Education, 9*(2), 189–201.Available at: https://doi.org/10.1093/deafed/enh020.

Leko, M., Brownell, M., Sindelar, P., & Murphy, K. (2012). Promoting special education preservice teacher expertise. *Focus on Exceptional Children, 44*(7), 1–16.Available at: https://doi.org/10.17161/foec.v44i7.6684.

Ling, R. (2010). Over the mountain: Tertiary education and graduate employment for people with a disability. *International Journal of Disability, Development and Education, 57*(1), 109–114.Available at: https://doi.org/10.1080/10349120903538036.

Liversidge, A. (2003). *Academic and social integration of deaf and hard-of-hearing students in a Carnegie research university.* Doctoral Dissertation, University of Maryland.

Lovejoy, P. (2016). IEP/504 checklist. Accommodations and modifications for students who are deaf and hard of hearing, New Hampshire deaf and hard of hearing education and resource center. Concord, USA. Retrieved from https://www.handsandvoices.org/pdf/IEP_Checklist.pdf.

Marschark, M., Shaver, D., Nagle, K., & Newman, L. (2015). Predicting the academic achievement of deaf and hard-of hearing students from individual, household, communication, and educational factors. *Exceptional Children, 81*(3), 350–369.Available at: https://doi.org/10.1177/0014402914563700.

McLennan, D., Hawkeswood, J., Leahy, M., Hindle, D., Kutchel, D., Geard, K., & Downie, A. (2014). *Teaching and assessment strategies for students with hard of hearing and deafness.* Australia: Australian Disability Clearinghouse on Education and Training.

Mishra, P., & Koehler, M. (2008). *Introducing technological pedagogical content knowledge.* Paper presented at the Annual Meeting of the American Educational Research Association.

Mohammed, S. (2020). The quality of the sign language interpreter's performance from the point of view of deaf and hard of hearing students and its relationship to academic performance. *Journal of Education, 10*(78), 1942–2002.Available at: https://doi.org/10.21608/edusohag.2020.109836.

Mwanyuma, R. (2016). *Factors influencing the academic achievement of deaf learners in Kilifi county, Kenya: A case of Sahaj Anand school for the deaf.* Doctoral Dissertation, University of Nairobi.

Omar, H. (2014). *A grounded theory study to evaluate the use of community-based technologies to enhance the educational experience for deaf and hard of hearing students in higher education.* Doctoral Dissertation, University of Hawaii. Available from ProQuest Central; ProQuest Dissertations & Theses Global. (3648582).

Peng, C., & Daud, S. (2015). *TPACK: A missing piece of the technology puzzle among special education (hard of hearing) teachers.* Paper presented at the Conference: Graduate Research in Education Seminar-GREDuc, University Putra Malaysia.

Peng, C., & Daud, S. (2016). *Relationship between Special Education (hearing impairment) teachers' technological pedagogical content knowledge (TPACK) and their attitudes toward ICT integration.* Paper presented at the International Conference on Special Education in Southeast Asia Region 6th Series, University Putra Malaysia.

Qi, S., & Mitchell, R. (2012). Large-scaled academic achievement testing of deaf and hard-of- hearing students: Past, present, and future. *Journal of Deaf Studies and Deaf Education, 17*(1), 1–18.Available at: https://doi.org/10.1093/deafed/enr028.

Raosoft, I. (2011). Sample size calculator. Retrieved from http://www.raosoft.com/samplesize.html.

Ropo, E. (2004). Teaching expertise. In Professional learning: Gaps and transitions on the way from novice to expert (pp. 159–179). Dordrecht: Springer.

Ruppar, A., Roberts, C., & Olson, A. (2015). Faculty perceptions of expertise among teachers of students with severe disabilities. *Teacher Education and Special Education, 38*(3), 240–253.Available at: https://doi.org/10.1177/0888406414552331.

Salem, S. (2017). The reality of students with hearing impairment using educational technologies in light of some variables in the stage of higher education. *Journal of Special Education and Rehabilitation, 5*(20), 66–113.Available at: https://doi.org/10.12816/0040297.

Saunders, J. (2012). The support of deaf students in the transition between further education and school into higher education. *Journal of Deafness and Education International, 14*(4), 199–216.Available at: https://doi.org/10.1179/1557069x12y.0000000011.

Schmidt, D., Baran, E., Thompson, A., Koehler, M., Mishra, P., & Shin, T. (2009). Technological pedagogical content knowledge (TPACK) the development and validation of an assessment instrument for preservice teachers. *Journal of research on Technology in Education, 42*(2), 123–149.Available at: https://doi.org/10.1080/15391523.2009.10782544.

Shulman, L. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4–14.Available at: https://doi.org/10.3102/0013189X015002004.

Sibley, E., Theodorakakis, M., Walsh, M., Foley, C., Petrie, J., & Raczek, A. (2017). The impact of comprehensive student support on teachers: Knowledge of the whole child, classroom practice, and teacher support. *Teaching and Teacher Education, 65,* 145–156.Available at: https://doi.org/10.1016/j.tate.2017.02.012.

Smith, D., & Andrews, J. (2015). Deaf and hard of hearing faculty in higher education: Enhancing access, equity, policy, and practice. *Disability and Society, 30*(10), 1521–1536.Available at: https://doi.org/10.1080/09687599.2015.1113160.

Sniatecki, J. L., Perry, H. B., & Snell, L. H. (2015). Faculty attitudes and knowledge regarding college students with disabilities. *Journal of Postsecondary Education and Disability, 28*(3), 259-275.

Spradbrow, G., & Power, D. (2004). Slipping through the cracks? The support needs of hard of hearing students in a university program. *Educating Deaf Students: Global Perspectives, 5*(8), 206–212.

Stewart, J., & Crane, C. (2019). Educational service guidelines for the students who are deaf and hard of hearing (pp. 1–75). Ohio USA: The Outreach Center for Deafness and Blindness.

Stinson, M., Elliot, L., & Kelly, R. (2017). Deaf and hard-of-hearing high school and college students' perceptions of speech-to-text and interpreting/note taking services and motivation. *Journal of Developmental and Physical Disabilities, 29*(1), 131–152.Available at: https://doi.org/10.1007/s10882-017-9534-4.

Sun, S., & Huang, T. (2016). School support services model for students with disabilities in general education classrooms: Using data from the special needs education longitudinal study in Taiwan. *Journal of Literature and Art Studies, 6*(9), 1063–1077.Available at: https://doi.org/10.17265/2159-5836/2016.09.009.

Valtonen, T., Sointu, W., Kukkonen, J., Kontkanen, S., Lambert, M., & Mäkitalo-Siegl, K. (2017). TPACK updated to measure pre-service teachers' twenty-first century skills. *Australasian Journal of Educational Technology, 33*(3), 15–31.Available at: https://doi.org/10.14742/ajet.3518.

Verma, C., Stoffova, V., & Zoltán, I. (2018). Perception difference of indian students towards information and communication technology in context of university affiliation. *Asian Journal of Contemporary Education, 2*(1), 36–42.Available at: https://doi.org/10.18488/journal.137.2018.21.36.42.

Wieman, C. (2019). Expertise in university teaching and the implications for teaching effectiveness, evaluation and training. *Dædalus, 148*(4), 47–78.Available at: https://doi.org/10.1162/daed_a_01760.

Wieser, C. (2020). Teaching expertise in higher education: Constructive alignment and how an experienced university teacher maintained constructive alignment in practice. In Ethnography in Higher Education (pp. 33–52). Wiesbaden: Springer.

Williams, H. (2017). *Support services for mainstream deaf college student writers: Three institutional case studies.* Doctoral Dissertation, Southern Illinois University. Available from ProQuest Central; ProQuest Dissertations & Theses Global. (10254724).