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University Students' Experiences of Secondary School Science Education: Analysis of Attitudes and Background Variables

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Abstract: University students' experiences and attitudes about a program of study and their career choices are to a greater extent influenced by their secondary school experiences. These experiences also apply to science subjects including chemistry. This research, therefore, sought to explore university students' experiences of secondary school chemistry education by examining their background variables as related to the pursuing of general science program. In this study participants reported different experiences and perceptions of science education in general and chemistry lessons in particular during their secondary school years. Using a mixed-method research approach 260 university students from the Greater Accra region of both urban and rural areas were surveyed and interviewed. Descriptive statistics and other statistical procedures were used to analyse the data. The results showed that students past experiences of science programs and particularly chemistry lessons had significant impact on their decision to study chemistry. It was also found that students' background variables such as gender, previous secondary school attended (rural/urban) and teachers' instructional practices had influence on attitudes to pursue a chemistry course. The results provide further evidence of the benefits of the use of well-equipped science laboratories and technology as supporting course resources for science education.

Keywords: Ghana, university students, science education, chemistry

Introduction

According to the World Development Report (World Bank, 2024), the integration of science and technology into national development strategies is crucial for promoting sustainable growth, improving quality of life, and addressing pressing challenges facing societies around the world. Scientific education, therefore, is to enable students to acquire knowledge and the necessary skills that would expand the level of creativity toward the application of science and technology. Studies have shown that background science knowledge plays a crucial role in pursuing a science study program and that students' past educational experiences affect their choice of study program and future career. Various studies have shown that students' past school experiences have significant impact on students' attitudes toward subjects or study programs (Haught et al., 2015). Haught et al. (2015) suggest that individuals' memories of their school experiences significantly influence their beliefs about a course of study and the broader educational process. This notion aligns with the hierarchical nature of science, where new concepts are constructed upon a pre-existing foundation of knowledge. For students, a robust understanding of foundational concepts is crucial; without it, they are likely to face difficulties in comprehending advanced topics. This hierarchical framework underscores the importance of early learning experiences in shaping future academic success.

Moreover, Miller and Shifflet (2016) emphasize that memories do more than form the basis for understanding; they also provide insights into an individual's current perceptions and beliefs. These reflections of past educational encounters help to anchor personal interpretations of educational content and influence ongoing cognitive engagement with learning.

Science, and for that matter, chemistry is often considered a challenging subject due to its abstract theories, complex calculations, and extensive memorization of chemical reactions and formulas. Some students may find it daunting and struggle to grasp certain concepts, leading to frustration or disinterest (Guido, 2013). Some studies explained that the principal aim of science education was to enable young people to make wise and sound decisions in their daily life and subsequent contribution to the technological and economic growth of the country. However, this hinges on good instructor experiences fostering positive attitudes to science subjects. Students are therefore, ushered into different levels of education. Typically, at the Senior High School

(SHS) level in Ghana, various topics are treated in detail to prepare the student enough for the tertiary educational level. Physics, Chemistry, Biology, Astronomy, and Geology are all included in the secondary school science curriculum, which has been constructed using an integrated scientific approach. However, some research has indicated that each science subject, including chemistry, needs to be taught as a stand-alone subject to provide students with the essential information and the right attitude toward the subject for academic achievement (Kurniawan et al., 2019).

The formation of positive attitudes for academic achievement depends on several other factors including teaching methods and instructional practices in the class. Many researchers have identified several factors that could have an impact on the quality of science teaching and learning, including the teacher's content knowledge and pedagogical skills. Factors such as instructional activities (Bakaç et al., 2011; Tomara et al., 2017), engaging laboratory works (Snětinová and Káčovský, 2019; Holmes and Lewandowski, 2020), teacher attitudes (Thibaut et al., 2018; Mami, 2021), and the use of scientific developmental strategies (Civelek et al., 2014; Maulidah and Prima, 2018; Abdusselam and Karal, 2020; Aragaw et al., 2022), contribute to the formation of positive attitudes for academic achievement (Holmes and Lewandowski, 2020).

The formation of positive attitudes by using engaging laboratory activities act to help students to confirm theoretical ideas. The fact that chemistry laboratory activities appeal as a way of allowing students to study with understanding and, at the same time, engage in a process of generating knowledge by doing science is proven (Holmes and Lewandowski, 2020). It has been observed that particularly chemistry, a course offered in most Ghanaian tertiary educational institutions, becomes very challenging to many students due to inadequate teacher preparation and inadequate as well as inappropriate instructional materials.

It is evident that chemistry teachers in most tertiary institutions do their possible best to improve the knowledge and interest of young chemists in the field of chemistry. But it has been noted that, a period after a student has taken a few chemistry courses, most students begin to lose hope and continue with the mindset that the course in general is difficult. Local researchers have echoed low enrolment rates of chemistry students in the universities without explaining why (Baidoo-An, 2022) and the alarming rate of lack of interest in science subjects is a big concern (Osei et al., 2023) as there is no literature on students' views about the study of this subject, making research into students'

perspectives on this specific subject important. In addition to addressing a potential gap in research by exploring the link between secondary school experiences and higher education outcomes, and serving as a foundation for further studies, this study provides insights into how secondary school science education shapes students' attitudes toward science. Identifying these factors contributes to global research on educational practices, aiding policymakers and educators in improving science curricula and fostering positive attitudes, which are critical for producing skilled professionals in science-related fields.

Literature Review

Generally, it has become a norm to hear students in senior high schools across nations refer to chemistry as being difficult, abstract, and unnecessary to humans, but teachers have recognized the benefits of chemistry in our societies despite its complexity. Especially in Brazilian classrooms, it has been observed that the lack of student interest in chemistry always results in discouraging teachers from searching for innovative and creative teaching and evaluation methodologies. According to Ana Luiza de Quadros et al., (2011), in a study done in certain Brazilian high schools, some teachers reported that one of the main variables affecting students' performance and ultimately, their hatred of learning is the incorrect way in which the concepts are delivered. These educators emphasized that the concepts taught to students should allow them to genuinely study chemistry rather than just memorizing definitions, formulas, and meaningless terminology. Instead, the notion should become a way of thinking for the students (Ana Luiza de Quadros et al., 2011).

Also, Baidoo-Anu (2022) reported that, between-school streaming has been a practice in various countries such as Portugal, Belgium, Luxembourg and in Ghanaian educational complex. The practice aims to achieve the shared objective of categorizing students based on their perceived academic capabilities and primarily, to establish a learning environment that is more uniform, enabling teachers to offer instruction that is better suited to the needs of their students, while allowing students to benefit from interacting with peers who are academically comparable to them. However, with all the positives of the practice of between-school streaming, there are some disadvantages associated. A common disadvantage is the socio-emotional effect on students. About 80% of students in the study reported that they experience low self-esteem and low academic

self-efficacy. Upon discovering that they have been assigned to category C schools, students tend to underestimate their academic skills and abilities. Only a few were confident about their academic capabilities even though they experience low self-esteem (Baidoo-Anu, 2022).

Osei et al. (2023) conducted a study in a well-resourced school located in the central region of Ghana to investigate the reasons why chemistry topics were perceived as challenging by students. The study involved 96 participants, specifically third-year science students, whose identities were kept confidential. The choice of third-year students was based on their greater exposure to many topics in the syllabus compared to junior students. The research methodology included the use of questionnaires and an interview guide with the students. The difficulty level of the topics was categorized based on their mean score, with a range of 1.80 to 3.00 indicating difficult topics and a range of 1.00 to 1.79 indicating relatively easier topics. The findings revealed that 67% of the topics, particularly those involving mathematical aspects, were considered difficult by the students. Examples of challenging topics included acid-base and salt concept, rates of reaction, energy changes, and bond enthalpies. On the other hand, topics such as the structure of the atom, nuclear chemistry, and solubility were perceived as relatively easier. According to the results obtained, students attribute the poor performance and difficulty of most chemistry topics to several factors. These factors included ineffective teaching techniques, lack of practical activities, and the absence of additional tutoring opportunities (Osei-antwi, 2023).

Ali (2012) highlights that students often struggle to generate original ideas or explanations that could enhance their understanding of a subject. Instead, they tend to rely on rote memorization, reproducing information verbatim rather than articulating the concepts, meanings, or ideas in their own words. This limitation is particularly evident when lessons require engagement with more advanced or complex content. Students frequently fail to establish conceptual connections, provide reasoned explanations to support their viewpoints, or pose meaningful questions. For example, in a lesson on balancing chemical equations, students demonstrated the ability to produce correctly balanced equations for practice problems. However, this success was attributed to their memorization of answers rather than a genuine understanding of the underlying principles. "When asked to explain the rationale behind assigning specific coefficients to

certain atoms and compounds, students were unable to provide a coherent justification, indicating a lack of conceptual comprehension” (Ali, 2012, p. 6).

Theoretical Framework

This study is grounded in Constructivist Learning Theory, linked to Self-Determination Theory (SDT) which posits that learners actively construct knowledge through interactions with their environment and personal experiences. Constructivist Learning Theory, articulated by scholars such as Piaget (1950) and Vygotsky (1978), emphasizes that learning is an active, contextualized process wherein individuals integrate new information with their existing cognitive frameworks. In this study, students’ experiences in secondary school science education are understood not as passive absorptions of knowledge but as dynamic processes shaped by their engagement with curricula, teaching methods, and the broader learning environment. These experiences significantly influence their overall perceptions, educational outcomes, and readiness for higher education.

Within this framework, learners play a central role in shaping their educational journeys through active participation in classroom interactions, scientific experiments, and problem-solving activities. Such engagements enable them to construct a deeper understanding of scientific concepts and their application in real-world scenarios. Vygotsky’s perspective on the social nature of learning highlights the importance of collaboration and interaction, as students’ experiences are enriched through meaningful exchanges with peers and teachers. Group experiments, discussions, and cooperative projects in secondary school science education foster not only comprehension but also motivation and a sense of community in learning.

Furthermore, the socio-cultural and institutional contexts of Ghanaian secondary schools serve as critical influences on students’ experiences. The availability of resources, the quality of teaching, and the alignment of curricula with local and global scientific needs are pivotal factors that frame their learning. These contextual elements interact with students’ active engagement, shaping their ability to internalize knowledge and develop a constructive perspective toward science education. By employing Constructivist Learning Theory, this study provides a holistic lens to examine how students actively construct their understanding of science within Ghana’s educational

landscape, thus offering insights into the interplay between education, context, and aspirations.

Purpose of the Study

Educational research in Ghana has focused more on general educational challenges, curriculum development, teaching methodologies, or Science, Technology, Engineering, and Mathematics (STEM) issues and less on chemistry as a single subject. This research sought to evaluate university students' experiences of secondary school chemistry education. It is also to examine students' background variables as related to the pursuing of a general science program.

Research Questions

The questions explored by this study were:

- 1. What are students' views/attitudes toward chemistry?*
- 2. What is the relationship between students' background variables (urban-rural, gender and method of teaching) and attitude towards learning chemistry?*
- 3. What are the challenges facing students learning chemistry?*

Method

1. Research Design and Study Location

The study adopted a mixed-method approach, combining quantitative analysis to identify trends and patterns with qualitative insights to provide depth and context. This design enhances the robustness and comprehensiveness of the findings.

The study was conducted at universities in the Greater Accra region of Ghana. Greater Accra has 34 recognized universities and higher education institutions. These include a mix of public, private, and specialized institutions, offering a range of undergraduate, postgraduate, and professional programs (see Figures 1a and 1b). Universities are located within various communities (see Table 1b). Out of 34 universities and high institutions in the region two universities (one private and one

public) were selected using stratified random sampling to ensure representativeness and diversity. While only two universities were sampled, the study's robustness is upheld by over 250 student participants, ensuring diverse perspectives and meaningful statistical power. The large participant pool enhances representativeness, mitigating limitations of institutional variety and strengthening the study's generalizability.

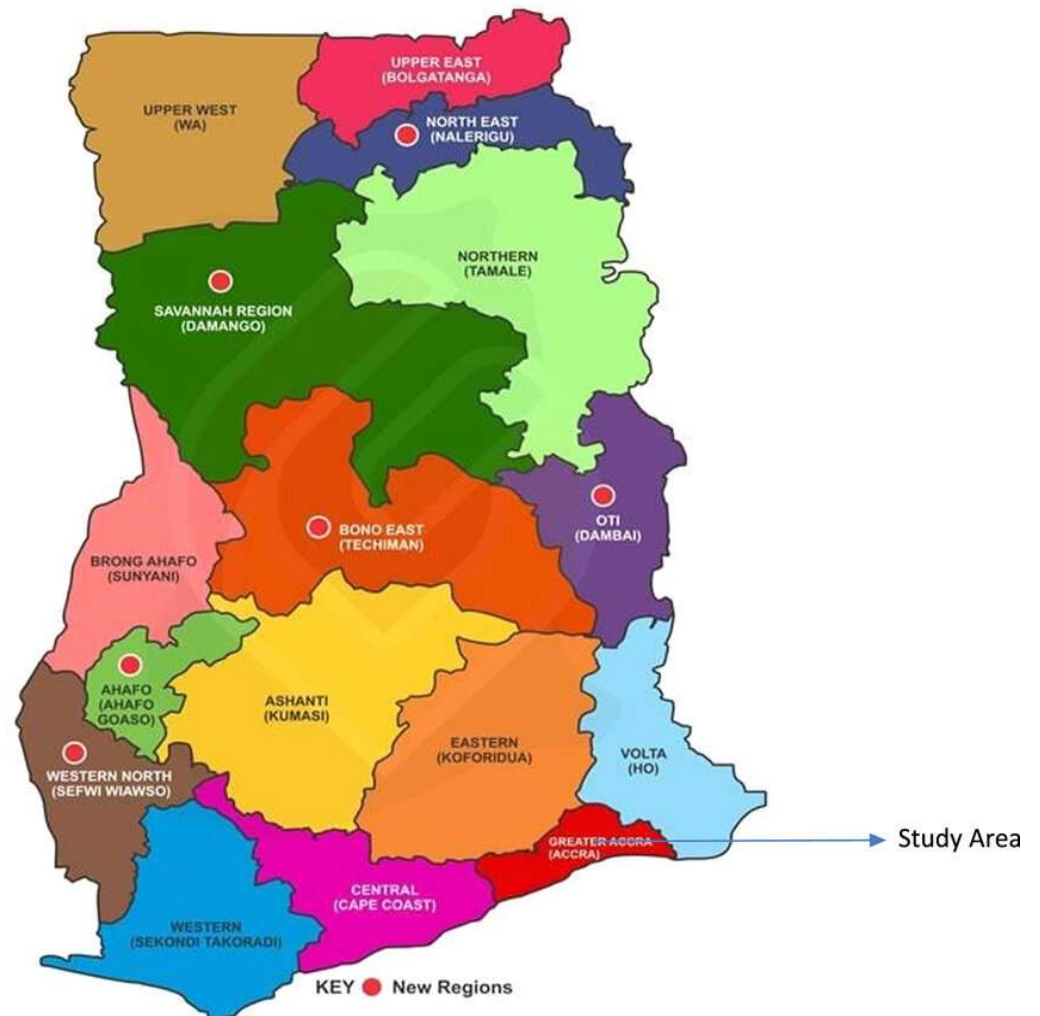


Figure 1a. Ghana map showing the study area, Accra (Opoku-Ntim et al., 2019)

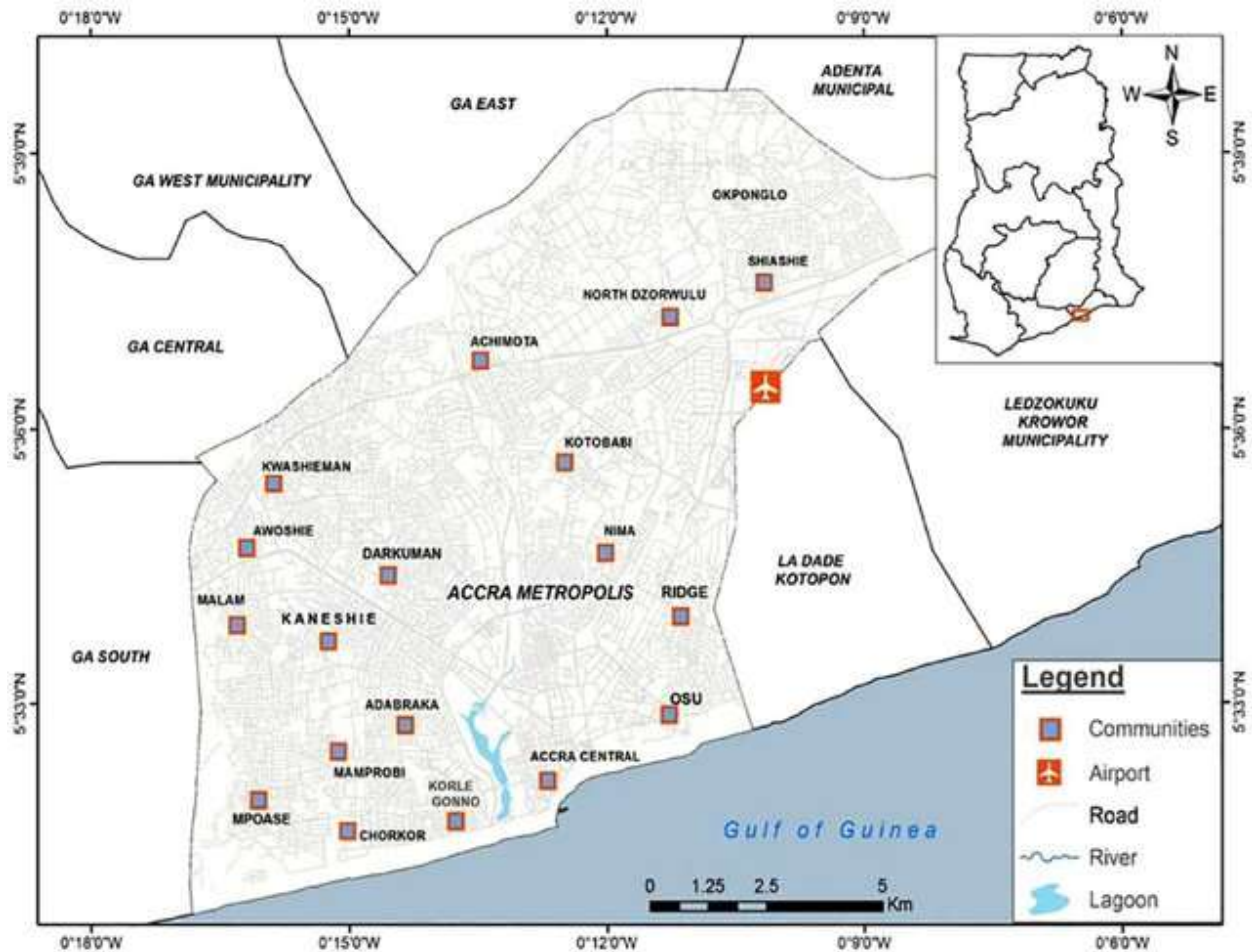


Figure 1b: Map of Greater Accra university locations; Source: Accra Metropolitan Assembly (2023)

2. Population and Sample

A total of 260 students participated in the study. The study targeted science students (chemistry, biology, physics, and mathematics) enrolled in undergraduate programs. Participants were drawn from both urban (62%) and rural (38%) secondary school backgrounds, ensuring variability in their educational experiences. A stratified sampling method was employed to balance demographic factors such as gender (46.7% female and 53.3% male), year of study (first-year: 38%, second-year: 18.35%, third-year: 19.15%, fourth-year: 24.5%).

Participants were recruited voluntarily, with ethical considerations addressed through informed consent. They were assured of their right to withdraw at any point without repercussions.

3. *Data Collection Instrument*

A structured survey was developed to gather data on students' attitudes, perceptions, and challenges in secondary-level science education through a systematic process. The foundation of this process involved a comprehensive review of the existing literature, which identified common themes and validated survey items through studies such as those by Williams et al. (2003), Hudson et al. (2010), and Miller and Shifflet (2016). This step ensured the incorporation of established insights into the survey design, fostering both relevance and robustness.

To further enrich the survey and tailor it to the target demographic, qualitative input was sought. An open-ended question was distributed to university students, encouraging them to reflect on their secondary school experiences with science subjects. This feedback offered nuanced perspectives and highlighted specific areas of concern and interest that were then integrated into the survey framework.

Using the insights from the literature and qualitative responses, an initial set of 19 survey items was drafted. These items underwent rigorous review by experts from the university's science department to assess their relevance and clarity, ensuring alignment with the study's objectives and enhancing the validity of the instrument.

The survey then proceeded through a pilot testing phase, during which it was further refined based on feedback from the trial respondents. The finalized version consisted of 14 carefully curated items. Its reliability was evaluated using Cronbach's alpha, yielding a value of 0.85, which indicates a high degree of internal consistency as per Shrestha (2021). This process underscores the survey's robustness and its capacity to provide reliable insights into secondary-level science education.

4. *Ethical Considerations*

The study adhered to institutional ethical guidelines. Participants' anonymity was maintained, and pseudonyms were used in qualitative data analysis to protect identities. Written informed consent was obtained, and participants were informed of their rights.

5. *Data Analysis Procedures*

The research addressed three main questions using appropriate statistical and qualitative techniques. For Research Question 1, descriptive statistics were used to analyze students' ratings of the importance of specific competencies in chemistry,

biology, physics, and mathematics. For Research Question 2 and the hypothesis, a series of independent-sample t-tests and One-Way ANOVA were conducted to evaluate differences in experiences based on gender, secondary school location (urban/rural), and year of study. For Research Question 3, frequency analysis was conducted to identify common challenges reported in chemistry and to compare these with challenges in other science subjects.

Results

The results of the study are reported in line with the key research questions, and indicators on students' views analysed as shown in Table 1a. In the evaluation of the choice of students studying general science program (Tables 1a and 1b), the descriptive statistics showed that students were mostly influenced by their parents rating the score of students ($M=5.1$, $SD=1.1$), followed by students' self-engagement ($M=5.01$, $SD= 1.05$) and teacher quality ($M=4.63$, $SD=1.2$). These scores were within the Strongly Agree and Agree Classification, while the rest of the 14 items ranging between 3.0 and 2.51 were those influenced by other reasons such as job opportunities, institutional reputation ($M=2.71$, $SD=1.25$), financial considerations ($M=2.51$, $SD=1.24$) and desire for intellectual challenge rated the lowest ($M=2.51$, $SD=1.29$).

Table 1a: Students views and influence in studying general science program

| | N | Mean | Std. Deviation |
|--|----------|-------------|-----------------------|
| 1. Parental influence | 260 | 5.06 | 1.05 |
| 2. Self-engagement and prior experiences | 260 | 5.01 | 1.05 |
| 3. Teacher quality | 260 | 4.63 | 1.19 |
| 4. Curriculum | 260 | 4.39 | 1.37 |
| 5. Personal skills and strength | 260 | 4.39 | 1.37 |
| 6. Availability of laboratory facilities | 260 | 3.22 | 1.38 |
| 7. Interest and passion | 260 | 3.22 | 1.31 |
| 8. Carrier aspirations | 260 | 3.04 | 1.31 |
| 9. Peer influence | 260 | 3.03 | 1.08 |
| 10. Educational background | 260 | 2.91 | 1.11 |
| 11. Perceived job opportunities | 260 | 2.72 | 1.33 |
| 12. Institutional reputation | 260 | 2.71 | 1.25 |
| 13. Financial considerations | 260 | 2.51 | 1.24 |
| 14. Desire for intellectual challenge | 260 | 2.51 | 1.29 |
| Valid N (listwise) | | | |

From *Table 1a* it can be seen that students' views about learning chemistry can vary widely depending on factors such as their prior experiences with the subject, their teacher's quality, the curriculum, and their personal interests and goals. A further analysis was undertaken to find students who have a positive attitude towards studying science subjects, particularly chemistry (see *Table 1b*).

Table 1b: Students general interest to study

| No. | Item | Responses | | Frequency | % | Chi-Square |
|-----|----------------------|-----------|-----|-----------|------|------------|
| | | Yes | No | | | |
| 7 | Interest and Passion | Yes | 195 | 195 | 75.0 | 0.004 |
| | | No | 65 | 65 | | |

The results revealed that a significant majority (75%) of respondents affirmed "Interest and Passion", and the responses showed a statistically insignificant deviation from the expected distribution, indicating a strong alignment among participants of their positive thoughts regarding the item. The culture course seems to have succeeded in accomplishing a task with some humanizing effect.

1. Attitudes towards Chemistry

Table 2: Attitudes Toward Chemistry

| Item | N | Mean | Std. Deviation |
|------------------------------------|-----|------|----------------|
| Practical Application | 260 | 4.89 | 1.369 |
| Engaging Teaching Methods | 260 | 4.48 | 1.539 |
| Relevance to Future Careers: | 260 | 4.38 | 1.832 |
| Real-Life Examples | 260 | 4.25 | 1.504 |
| Supportive Learning Environment | 260 | 4.05 | 1.668 |
| Innovative Resources | 260 | 3.98 | 1.421 |
| Recognition and Rewards | 260 | 3.97 | 1.717 |
| Career Opportunities | 260 | 3.93 | 1.585 |
| Integration with Other Subjects | 260 | 3.87 | 1.714 |
| Societal Importance | 260 | 3.86 | 1.692 |
| Perceived Difficulty | 260 | 3.85 | 1.634 |
| Lack of Resources | 260 | 3.72 | 1.689 |
| Teaching Methods | 260 | 3.67 | 1.504 |
| Limited Practical Exposure | 260 | 3.59 | 1.547 |
| Perception of Career Opportunities | 260 | 3.58 | 1.446 |
| Cultural Factors | 260 | 3.52 | 1.374 |
| Valid N (listwise) | 260 | | |

Corrected Item-total correlations = 0.00

The attitude scores in Table 2 above shows more positive attitudes among students for learning chemistry. The highest score is 4.89 for the item Practical Application on a 6-point scale, which equates to the Somewhat Agree range. Six other items relating to students' negative attitudes to chemistry lessons are related to perceived difficulty, lack of resources, unfavourable teaching methods, limited practical exposure, lack of job opportunities and cultural factors. These items have mean scores below 3.90 which are firmly in the negative attitude category, implying that the participants did not like chemistry in high school.

2. Influence of Background Variables on Student Attitudes and Choices

The analysis showed that attitude scores were significantly related to students' experience of chemistry lessons in secondary school at $p = .05$ confidence level (see Table 3 and 4 below). Participants with good experiences of chemistry lessons ($M=71.7$) had significantly higher levels of motivation compared to those without such experiences ($M=61.3$). Participants with positive experiences of the way chemistry was taught (teaching methods) in secondary schools were also found to have positive attitudes towards chemistry as a subject ($M=71.7$) when compared to those who did not have such experience ($M=61.3$). It was found that there were significant differences between students coming from well-equipped science secondary schools from the urban areas and students who attended secondary schools in the rural areas. Post-hoc analysis using ANOVA showed that the mean score of students from the rural secondary schools was significantly lower ($M=68.8$) when compared to those from urban areas ($M=73.3$) (see Table 5).

Table 3: Secondary school experience and attitudes

| Secondary Education | N | Mean | Std. Deviation | Sig. (p) |
|---------------------|-----|------|----------------|----------|
| No | 100 | 61.3 | 6.69 | .000 |
| Yes | 160 | 71.7 | 9.57 | |

*. The mean difference is significant at the 0.05 level.

Table 4: t-test: Students' experience of teaching methods and attitudes

| Experience of teaching method | N | Mean | Std. Deviation | Sig (p) |
|-------------------------------|-----|------|----------------|---------|
| No | 119 | 63.8 | 7.99 | .000 |
| Yes | 141 | 70.3 | 9.87 | |

*. The mean difference is significant at the 0.05 level.

Table 5: Students' previous schools and attitudes

| Previous Secondary | N | Mean | Std. Deviation | ANOVA (P) |
|--------------------|-----|------|----------------|-----------|
| Rural | 100 | 68.8 | 8.56 | .05 |
| Urban | 160 | 77.3 | 15.20 | |
| Total | 260 | | | |

* The mean difference is significant at the 0.05 level.

3. *Urban/Rural Schools and Attitude Scores*

The ANOVA analysis indicates that the secondary school attended has significant effect on students' attitudes ($p=.033$) at the .05 confidence level. The multiple comparison table (Tukey HSD) shows that main differences occurred between those who attended urban secondary and those who attended rural secondary schools (Mean Difference = -9.4495, $p=.026$) (Table 6 and 7).

Table 6: ANOVA of urban/rural secondary schools and attitudes

| ANOVA | | | | | |
|-----------------|----------------|-----|-------------|-------|------|
| Attitude Scores | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 1935.570 | 4 | 477.893 | 2.635 | .033 |
| Within Groups | 21579.663 | 128 | 173.404 | | |
| Total | 23495.234 | 132 | | | |

Table 7: Tukey HSD Multiple Comparison: Urban/rural schools and attitudes

| Multiple Comparisons | | | | | | | |
|-------------------------------------|---------------------|---------------------|-----------------------|------------|------|-------------------------|-------------|
| Dependent Variable: Attitude Scores | | | | | | | |
| | (I) Rural secondary | (J) Urban secondary | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
| | | | | | | Lower Bound | Upper Bound |
| Tukey HSD | | | -9.44995* | 3.10355 | .026 | -17.9276 | -.7523 |

*. The mean difference is significant at the 0.05 level.

4. *Gender and Attitudes Towards Chemistry*

The step taken here was to contrast the mean scores of males on each of the 16 items of the chemistry attitude scale with females' mean scores to assess whether there was a significant effect due to gender. A significant difference was found in students' attitudes because of gender, implying that gender had effect on their attitudes toward

studying science program (chemistry). The research data analysis of the attitudes of male and female students showed significant differences. Females are less willing to study chemistry (see Table 8). One key reason for the disparity in Ghana, where more male students pursue science and chemistry than females, is perhaps gender stereotypes and societal expectations. In many communities, traditional beliefs and cultural norms still discourage girls from engaging in Science, Technology, Engineering, and Mathematics (STEM) fields. These stereotypes suggest that science is “too difficult” or “better suited for boys”, which can negatively influence girls’ confidence, interest, and encouragement from parents or teachers to pursue these subjects.

Table 8: Means and t-test: Gender affects attitude

| Item | Means for groups | t. | p. |
|--------------------|-----------------------|------|---------|
| Students’ attitude | Student gender | 3.05 | (.062)* |
| | Male student = 3.02 | | |
| | Female student = 2.57 | | |
| | N = 260 | | |

*P<.05

5. *Challenges facing chemistry students*

We also calculated the overall scores for all participants on three of the major challenges. Overall, quantitative data analysis showed that the participants rated infrastructure and laboratory facilities as having a huge effect on their chemistry learning (55.77%). 25% of the participants named teacher shortages and qualifications as a challenge, followed by limited resources at 19.23% (See Table 9).

Table 9: Overall challenges in learning chemistry

| Response | Frequency | Percent |
|--|-----------|---------|
| Limited Resources | 50 | 19.23 |
| Teacher Shortages and Qualifications | 65 | 25.0 |
| Infrastructure and Laboratory Facilities | 145 | 55.77 |
| Total | 260 | 100 |

Chemistry students in Ghanaian secondary schools face various challenges, some of which are, as participants noted, perceived difficulty and language barrier especially complex concepts. Even when teachers are available, they may lack sufficient training or qualifications to effectively teach complex topics in chemistry.

Discussion

This study explored university students' experiences of chemistry lessons in high school. Generally, students had a positive attitude towards the choices they have made, but with some variations. It was found that the majority of the students were influenced by their parents and to a larger degree by the students themselves in their decision regarding their study program. Students' self-determination is linked to the Self-Determination Theory (SDT) also supported by Piaget (1950) and Vygotsky (1978) emphasizing the importance of intrinsic motivation, autonomy, and competence. The influence of parents on the other hand may stem from a combination of cultural, economic, and social factors that prioritize family cohesion, financial stability, and traditional values.

This is not surprising due to perhaps strong emphasis on family cohesion and respect for elders. In the Ghanaian context parents are often seen as wise and experienced individuals whose guidance is highly valued. Children are expected to heed their parents' advice and follow traditions. In many African families, parents financially support their children through education. As a result, parents often feel entitled to have a say in their children's educational and career decisions, viewing it as an investment in their future. The study involved students from both urban and rural areas of Greater Accra and access to information about different career paths and educational opportunities may be limited. Parents, who may have limited exposure to diverse career options themselves, tend to influence their children based on their own experiences and perceptions of success.

Generally, participants liked chemistry, but few students liked the subject in high school, supporting previous research showing that chemistry is not a popular subject and job and career prospects is lower than other programs such as medicine, engineering or biochemistry (Barmy and Defty, 2006; Williams et al., 2003). Again, students view chemistry as a difficult subject, with limited practical exposure. Chemistry is a practical

subject that requires hands-on experimentation to fully understand concepts. However, many schools in Ghana, especially in the rural areas, may lack well-equipped laboratories or may not prioritize practical learning experiences due to misallocation of resources between urban and rural secondary institutions to the disadvantage of the latter. Without adequate practical exposure, students may struggle to connect theoretical concepts with real-world applications, leading to disengagement with the subject (Williams et al., 2003; Erinosh, 2013; Patil et al., 2019). However, those who liked chemistry found it to be less difficult (Oon and Subramaniam, 2013). As noted in this study, the majority of the participants were from the cities (urban areas) with perhaps well-equipped science departments in secondary schools, the fact that students had relatively positive attitudes could explain this result.

It was found in the study that teaching methods and instructional practices in the classroom had a significant effect on students' attitudes toward learning chemistry. This finding is consistent with other studies which say that effective teaching methods not only facilitate the transmission of knowledge but also inspire and sustain students' motivation to learn by engaging them actively, making learning meaningful, fostering autonomy, providing constructive feedback, creating a supportive environment, offering variety and flexibility, setting clear goals, and nurturing intrinsic motivation (Ramaila and Reddy, 2018).

Variables such as gender, urban/rural secondary school setting and teaching methods had significant effect on their attitudes toward chemistry. With respect to gender, it was found that fewer female students were studying chemistry and other science subjects. This finding is consistent with the studies of (Barmby and Defty, 2006; Saleh and Subramaniam, 2019) stating that female students generally do not like chemistry and other science programs. However, other studies (Achor and Gbadamosi, 2020; de Barros Vidor et al., 2020) found no statistically significant difference in students' attitudes and thoughts according to gender. Nonetheless, gender can indeed influence students' choices of science subjects in Ghana, as it does in many other countries. In this study, like in numerous other societies similar to the study area, there are cultural and societal norms that may influence how individuals perceive certain subjects as being more suitable or appropriate for one gender over another. For example, there may be stereotypes or perceptions that certain science subjects, such as chemistry or engineering, are more suited for males, while subjects like biology or nursing are more

suiting for females. These stereotypes can impact students' perceptions of their own abilities and interests. Additionally, access to educational resources and opportunities may also differ based on gender, further influencing students' choices. For instance, if certain schools or communities prioritize resources and encouragement for male students in science subjects, it can perpetuate gender disparities in STEM (science, technology, engineering, and mathematics) fields.

The overall analysis of this study found that memories of students' experiences in their schools or academic environments can significantly impact their decisions regarding future careers and their relationships with relevant courses as found in this study. Positive experiences can inspire students to pursue further education and careers in a particular field, while negative experiences may deter them. If students have positive memories associated with a particular subject or course, such as engaging and supportive teachers, exciting projects, or success in learning and understanding the material, they are more likely to develop an interest and passion for that subject (Hazari et al., 2017). These positive memories can motivate students to pursue further education and careers related to that subject. Conversely, negative memories, such as struggling with difficult material (prevalent in rural secondary schools), feeling unsupported or discouraged by teachers, or experiencing bullying or discrimination in the academic environment, can lead students to develop a dislike or aversion to certain subjects. These negative memories may influence students to avoid pursuing further education or careers in those areas. In schools with well-equipped science laboratories, studies have found effective teaching processes and the use of techniques that encourage student engagement in the course and positively impact student thinking (Samsudin et al., 2020; Nuñez et al., 2021). In a similar study it was found that the use of technology has a particularly successful impact on students' attitudes and perceptions of science programs including chemistry courses (Hochberg et al., 2018; Maulidah and Prima, 2018; Bakri et al., 2020).

Conclusion and Implication

The majority (75%) of the participants were generally positive to chemistry programs and liked the course, but not all of them. Chemistry, physics, and biology are all distinct scientific disciplines, each with its own set of challenges for students. However, there are some specific challenges that chemistry students may face compared to those

studying physics and biology. One of the negative attitudes to chemistry as found in this study is perceived difficulty. Chemistry often deals with abstract concepts such as atomic structure, chemical bonding, and quantum mechanics. Understanding these concepts may be challenging for some students as they require a strong foundation in mathematics and a willingness to think abstractly. While all sciences use mathematics to some extent, chemistry often requires more mathematical rigor than biology.

Results on students' background variables had significant impact on their attitudes towards chemistry courses. Variables leading to negative attitudes have had negative impact on the study of chemistry at the tertiary level resulting in fewer students at the university due to either weaker educational foundation in chemistry in secondary schools or perceived difficulty of the subject. Students may struggle with mathematical concepts such as stoichiometry, chemical kinetics, and thermodynamics. Chemistry often involves hands-on laboratory work, which requires proficiency in techniques such as titration, spectroscopy, and chromatography. Developing these skills can be challenging and time-consuming for students. While these challenges may seem daunting, they can also be opportunities for growth and learning. With dedication, perseverance, and support from teachers and peers, chemistry students can overcome these challenges and develop a deeper understanding and appreciation of the subject.

For a comprehensive chemistry education, there is the need for textbooks, laboratory equipment and chemicals. Most secondary schools in Ghana may face problems providing resources. Both theory and practical in chemistry need resources and limitation for resources may affect practical aspect of learning chemistry.

For Ghana to keep pace in science and technology development, training of science teachers in general and chemistry in particular, as well as provision of well-equipped laboratories in secondary schools has to become a priority. The quality of teaching in secondary chemistry education may have significant impact on students' experiences when resources are equally allocated in both rural and urban areas. Teachers who are well trained and experienced and are passionate about the subject can make a positive difference in students' learning outcomes. However, the availability of qualified teachers may be a challenge in many schools, creating variabilities in chemistry students' experiences.

It is important to note that experiences of university students may vary because of individual schools and personal circumstances. It is also worth mentioning that these

factors are not unique to Ghana and can be applied to students' experiences in chemistry education in other countries from the developing countries as well. Efforts by government, educational institutions, and educators to improve the quality of secondary chemistry education could help enhance students' experiences and prepare them for further studies in chemistry-related fields at the university level. A key limitation of this study is focusing the attention of participants on chemistry education. It is therefore recommended that future research should be conducted across other disciplines as well as the coverage of a broader area.

The Contribution of the Authors

AMA and CYF collected the data, coded the data, and discussed the results. Both authors interpreted the results and contributed to the practical implications of the article.

Ethical statement

This research adhered to the highest standards of ethical conduct, as established by institutional and international guidelines. The study protocol was submitted to the Institutional Review Board (IRB) of the chemistry department, where it underwent a rigorous review process to ensure compliance with ethical principles and regulatory requirements, which was approved prior to the conduct of the study. Consent was obtained from the participants who signed an informed consent form after they were told that their participation was voluntary, anonymous, and their responses would be kept confidential. Participants were also informed that they could withdraw from participation at any time they wanted without any consequences. The ethical guidelines were adhered to through honesty in communication, trustworthiness in writing, confidentiality, and the sharing of reflections, ideas, and findings with respondents.

References

- Abdusselam, M. S., & Karal, H. (2020). The effect of using augmented reality and sensing technology to teach magnetism in high school physics. *Technology, Pedagogy and Education, 29*(4), 407–424. <https://doi.org/10.1080/1475939X.2020.1766550>
- Accra Metropolitan Assembly. (2023). *The Assembly*. Retrieved December 3, 2024, from <https://www.ama.gov.gh/the-assembly>
- Achor, E. E., & Gbadamosi, O. B. (2020). Raising the achievement and retention levels of secondary school students in physics through brain-based learning strategy in Taraba State, Nigeria. *BSU Journal of Science, Mathematics and Computer Education, 1*, 1–13.
- Ali, T. (2012). A case study of the common difficulties experienced by high school students in chemistry classroom in Gilgit-Baltistan (Pakistan). *SAGE Open, 2*(2), 1–13. <https://doi.org/10.1177/2158244012447299>
- Aragaw, A. M., Alemu, S. A., & Seyoum, D. G. (2022). Improving secondary school students' physics achievement through scaffold simulated analogical reasoning strategy. *Pedagogical Research, 7*, em0136. <https://doi.org/10.29333/pr/12391>
- Baidoo-Anu, D. (2023). Between-school streaming: Unpacking the experiences of secondary school teachers and students in category C schools in Ghana. *International Journal of Educational Research Open, 3*, 100188. <https://doi.org/10.1016/j.ijedro.2022.100188>
- Bakaç, M., Taşoğlu, A. K., & Akbay, T. (2011). The effect of computer-assisted instruction with simulation in science and physics activities on the success of students: Electric current. *European Journal of Physics and Chemistry Education, 3*, 34–42.
- Bakri, F., Permana, H., Wulandari, S., & Mulyati, D. (2020). Student worksheet with AR videos: Physics learning media in laboratory for senior high school students. *Journal of Technology and Science Education, 10*(2), 231–243. <https://doi.org/10.3926/jotse.891>
- Barmby, P., & Defty, N. (2006). Secondary school pupils' perceptions of physics. *Research in Science & Technological Education, 24*(2), 199–215. <https://doi.org/10.1080/02635140600811585>
- Civelek, T., Uçar, E., Üstünel, H., & Aydın, M. K. (2014). Effects of a haptic augmented simulation on K-12 students' achievement and their attitudes towards physics.

Eurasia Journal of Mathematics, Science and Technology Education, 10(6), 565–574. <https://doi.org/10.12973/eurasia.2014.1122a>

de Barros Vidor, C., Danielsson, A., Rezende, F., & Ostermann, F. (2020). What are the problem representations and assumptions about gender underlying research on gender in physics and physics education? A systematic literature review. *Revista Brasileira de Pesquisa em Educação em Ciências*, 20, 1133–1168. <https://doi.org/10.28976/1984-2686rbpec2020u113311>

de Quadros, A. L., CarvalhoDa-Silva, D., Silva, F. C., Pereira de Andrade, F., Aleme, H. G., Tristão, J. C., Oliveira, S. R., Santos, L. J., & De Freitas-Silva, G. (2011). The knowledge of chemistry in secondary education: Difficulties from the teachers' viewpoint. *Educación Química*, 22(3), 232–239. [https://doi.org/10.1016/S0187-893X\(18\)30139-3](https://doi.org/10.1016/S0187-893X(18)30139-3)

Erinosho, Y. S. (2013). How do students perceive the difficulty of physics in secondary school? An exploratory study in Nigeria. *International Journal of Cross-Disciplinary Subjects in Education*, 3(3), 1510–1515. <https://doi.org/10.20533/ijcdse.2042.6364.2013.0212>

Guido, R. M. D. (2013). Attitude and motivation towards learning physics. *International Journal of Engineering Research and Technology*, 2(11), 2087–2094.

Haight, P., Nardi, H. A., & Walls, R. T. (2015). Preservice teachers' academic memories of school: A tool for learning. *American Journal of Educational Research*, 3(2), 166–172. <https://doi.org/10.12691/education-3-2-9>

Hazari, Z., Brewe, E., Goertzen, R. M., & Hodapp, T. (2017). The importance of high school physics teachers for female students' physics identity and persistence. *The Physics Teacher*, 55(2), 96–99. <https://doi.org/10.1119/1.4974122>

Hochberg, K., Kuhn, J., & Müller, A. (2018). Using smartphones as experimental tools—Effects on interest, curiosity, and learning in physics education. *Journal of Science Education and Technology*, 27(5), 385–403. <https://doi.org/10.1007/s10956-018-9731-7>

Holmes, N. G., & Lewandowski, H. J. (2020). Investigating the landscape of physics laboratory instruction across North America. *Physical Review Physics Education Research*, 16(2), 020162. <https://doi.org/10.1103/PhysRevPhysEducRes.16.020162>

- Hudson, P., Usak, M., Fančovičová, J., Erdogan, M., & Prokop, P. (2010). Preservice teachers' memories of their secondary science education experiences. *Journal of Science Education and Technology*, 19(6), 546–552. <https://doi.org/10.1007/s10956-010-9221-z>
- Kurniawan, D. A., Astalini, A., & Sari, D. K. (2019). An evaluation analysis of students' attitude towards physics learning at senior high school. *Jurnal Penelitian dan Evaluasi Pendidikan*, 23(1), 26–35. <https://doi.org/10.21831/pep.v23i1.20821>
- Maulidah, S. S., & Prima, E. C. (2018). Using physics education technology as virtual laboratory in learning waves and sounds. *Journal of Science Learning*, 1(3), 116–121. <https://doi.org/10.17509/jsl.v1i3.11797>
- Mami, W. S. (2021). The effect of teachers' attitudes on students' learning of grade-8 students of MSU-Sulu Laboratory High School. *International Journal of Research in Engineering, Science and Management*, 4(9), 59–63.
- Miller, K., & Shifflet, R. (2016). How memories of school inform preservice teachers' feared and desired selves as teachers. *Teaching and Teacher Education*, 53, 20–29. <https://doi.org/10.1016/j.tate.2015.10.002>
- Nuñez, R. P., Hernández, C. A., & Gamboa, A. A. (2021). Active learning and knowledge in physics: A reading from classroom work. *Journal of Physics: Conference Series*, 1981(1), 012007. <https://doi.org/10.1088/1742-6596/1981/1/012007>
- Oon, P. T., & Subramaniam, R. (2013). Factors influencing Singapore students' choice of physics as a tertiary field of study: A Rasch analysis. *International Journal of Science Education*, 35(1), 86–118. <https://doi.org/10.1080/09500693.2012.718098>
- Opoku-Ntim, I., Gyampo, O., & Andam, A. B. (2019). Risk assessment of radon in some bottled water on the Ghanaian market. *Environmental Research Communications*, 1(10), 105001. <https://doi.org/10.1088/2515-7620/ab4568>
- Osei-Antwi, D., Essiam, C., & Quayson, C. (2023). Are chemistry topics difficult to learn? The stance of Ghanaian senior high school students. *International Journal of New Trends in Arts, Sports & Science Education*, 12(2), 112–121.
- Patil, P., Gaikar, P. S., Kathare, P. V., Gaikwad, G. L., Gaikwad, G. L., Sawant, D. U., et al. (2019). Analysis of psychological approach behind physics subject—Feels difficult. *Think India Journal*, 38, 158–164.
- Piaget, J. (1950). *The origins of intelligence in children*. International Universities Press.

- Ramaila, S., & Reddy, L. (2018). First year university physics students' perceptions of teaching methods. In J. Engelbrecht (Ed.), *The 62nd Annual Conference of the South African Institute of Physics* (pp. 294–299). https://events.saip.org.za/event/91/attachments/2266/3110/SAIP2017_294-299.pdf
- Saleh, S., & Subramaniam, L. (2019). Effects of brain-based teaching method on physics achievement among ordinary school students. *Kasetsart Journal of Social Sciences*, 40, 580–584. <https://doi.org/10.1016/j.kjss.2017.12.025>
- Samsudin, M. A., Jamali, S. M., Zain, A. N. M., & Ebrahim, N. A. (2020). The effect of STEM project-based learning on self-efficacy among high-school physics students. *Journal of Turkish Science Education*, 17, 94–108. <https://doi.org/10.36681/tused.2020.15>
- Shrestha, N. (2021). Factor analysis as a tool for survey analysis. *American Journal of Applied Mathematics and Statistics*, 9(1), 4–11. <https://doi.org/10.12691/ajams-9-1-2>
- Snětinová, M., & Káčovský, P. (2019). Hands-on experiments in the interactive physics laboratory: A study of students' intrinsic motivation. *Journal of Physics: Conference Series*, 1287, 012049. <https://doi.org/10.1088/1742-6596/1287/1/012049>
- Thibaut, L., Ceuppens, S., De Loof, H., De Meester, J., Goovaerts, L., Struyf, A., Boeve-de Pauw, J., Dehaene, W., Deprez, J., De Cock, M., Hellinckx, L., Knipprath, H., Langie, G., Struyven, K., Van de Velde, D., Van Petegem, P., & Depaepe, F. (2018). Integrated STEM education: A systematic review of instructional practices in secondary education. *European Journal of STEM Education*, 3(1), Article 02. <https://doi.org/10.20897/ejsteme/85525>
- Tomara, M., Tselfes, V., & Gouscos, D. (2017). Instructional strategies to promote conceptual change about force and motion: A review of the literature. *Themes in Science and Technology Education*, 10, 1–16.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- Williams, C., Stanisstreet, M., Spall, K., Boyes, E., & Dickson, D. (2003). Why aren't secondary students interested in physics? *Physics Education*, 38(4), 324–329. <https://doi.org/10.1088/0031-9120/38/4/306>
- World Bank. (2024). *World development report 2024*. <https://www.worldbank.org/en/publication/wdr2024>

Development and Factorial Validation of a Scale for Measuring the Causes of Data Fabrication in Education Research Studies in Nigeria

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Abstract: The research focuses on creating and validating the Causes of Data Fabrication Scale (CDFS) to understand the reasons behind data fabrication in educational research. Initially comprising 38 items, the scale was refined to 27 items based on expert input and content validity. Using a sample of 143 educators, the study employed rigorous statistical methods, identifying five key factors contributing to data fabrication: researcher-related issues, institutional factors, respondent influences, funding challenges, and research competence. Despite slight deviations in some item loadings, their significance in literature and expert agreement justified their inclusion. Overall, the study offers a crucial tool for scholars to investigate data fabrication causes, enhancing academic integrity in educational research.

Keywords: Data fabrication, research misconduct, validity, reliability, factor analysis

Introduction

Researchers must conduct research responsibly since academic integrity is critical to the academic community's foundation and reputation (Rajah-Kanagasabai & Roberts, 2015). The overarching construct underpinning this study is research misconduct, a multifaceted phenomenon encompassing various unethical practices such as data fabrication, falsification, plagiarism, authorship issues, and unethical research conduct. Within this broader landscape of research misconduct, the present study narrows its investigative lens specifically on data fabrication—a practice characterized by the deliberate creation of false or misleading data representations. This focus is predicated on the alarming prevalence and ramifications of data fabrication within academic and research settings, as corroborated by seminal studies (Bouter et al., 2016; Laskar, 2017).

Making up data or findings and reporting them is known as data fabrication. It entails changing data and reporting it as though it were a true depiction of a study that never took place. When a researcher utilizes personal data to fill up an interview schedule or questionnaire, this is known as data fabrication. (Kang & Hwang, 2020). According to researchers, papers have been withdrawn as a result of fabrication (Dal-Ré & Ayuso, 2021; Kuroki, 2018; Nurunnabi & Hassain, 2019). The users of the results are apt to be misled into believing that the study is authentic and dependable when it is not. (Bouter et al., 2016; Freitas et al., 2021; Gaspar & Esteves, 2021; Stacey, 2016). The factors that encourage or make researchers engage in data fabrication need to be investigated. In the field of education, there appears to be no scale to measure the causes of data fabrication. We believe that for the causes of data fabrication to be properly investigated, there is a need to develop a scale on it in the Nigerian setting. The development of a scale on the causes of data fabrication within the Nigerian context holds significant implications for academic rigor, societal trust, and economic competitiveness. Academically, these courses act as safeguards against the compromise of research integrity by equipping scholars with the skills necessary to identify and mitigate fraudulent practices in data collection and analysis. Societally, they promote transparency and accountability, thereby reducing the potential for skewed perceptions and misguided policy decisions. Economically, the accuracy and reliability of data are essential for Nigeria's position in the global marketplace, influencing investment attractiveness and sustainable growth prospects (Omumu et al., 2022). Thus, the imperative for such educational initiatives

transcends mere academic concerns, fostering a culture of integrity, innovation, and societal impact within a rapidly evolving research landscape.

There are several surveys and questionnaires on assessing researchers' misconduct. Some of them addressed the prevalence of research misconduct (Broome et al., 2005; Hadji et al., 2016; Khadem-Rezaiyan & Dadgarmoghaddam, 2017; Rankin & Esteves, 1997; Shamsoddin et al., 2021) and publication pressure (Tijdink et al., 2014). The Persian research misconduct questionnaire (PRMQ) consisted of 63 items. A section of the questionnaire concentrated on why researchers engaged in research misconduct (Shamsoddin et al., 2021). Khajedaluae et al. (2019) questionnaire contained 75 items that assessed norms and attitudes towards plagiarism. A 5-point scale containing 60 research misbehaviours was used by Bouter et al. (2016) to identify the frequency of occurrence, preventability, impact on truth (validity), and impact on trust among scientists on the research misbehaviours listed in the questionnaire. All the scales used in these studies focused on research misconduct and were interested in finding out the levels of prevalence of research misconduct. Research misconduct includes data fabrication, falsification, plagiarism, authorship issues, unethical research, etc. There is need to have a clear understanding of each of these components of research misconduct. A scale that focuses solely on measuring the causes of data fabrication is needed to understand data fabrication issues properly. In addition, most of the work on research misconduct was done in the medical field (Ghajarzadeh et al., 2013; Poutoglidou et al., 2022; Shamsoddin et al., 2021). Data fabrication can negatively affect the medical field and also affect other areas, including the education sector.

The pertinence of this study gains heightened significance within the Nigerian context, where empirical investigations into the causative factors and implications of data fabrication remain conspicuously scant. Despite the burgeoning academic landscape in Nigeria, characterized by increasing research endeavours and scholarly outputs, there exists a palpable lacuna in comprehensive assessments of data fabrication within educational studies. This lacuna is not merely an academic oversight but engenders profound implications for academic integrity, societal trust, and economic competitiveness within the Nigerian milieu.

The urgency of investigating data fabrication within Nigeria is further exacerbated by global trends and empirical evidence highlighting its detrimental effects on research integrity and credibility. While extant literature offers invaluable insights into research

misconduct, including data fabrication, most of these studies are situated within Western contexts, predominantly in the medical field. Consequently, there exists a conspicuous gap in understanding data fabrication dynamics within diverse socio-cultural and academic landscapes, particularly within the educational sector in Nigeria.

Hence, the primary objective of this study is to develop and factorial validate a scale specifically tailored to measure the causes of data fabrication within educational studies in Nigeria. By elucidating the underlying factors precipitating data fabrication, this study aspires to furnish the academic community with a robust instrument for critically examining and mitigating this pervasive malfeasance. This study seeks to develop and validate a new scale to measure the causes of data fabrication in education studies in Nigeria. The study describes the underlying factors found within the scale. A scale that measures the causes of data fabrication could help the research environment to examine data fabrication more critically and provide cues on ways to eliminate it. The scale will help education researchers in developing countries to measure the causes of data fabrication in their respective environment. In this study we present a brief explanation on the procedure used in the initial development of the 'Causes of data fabrication scale' (CDFS). The psychometric properties of the scale were discussed in detailed.

Method

The current study is part of a broader project. Figure 1 shows an overview of the processes utilized, which is similar to the one used by Goh and Blake (2021).

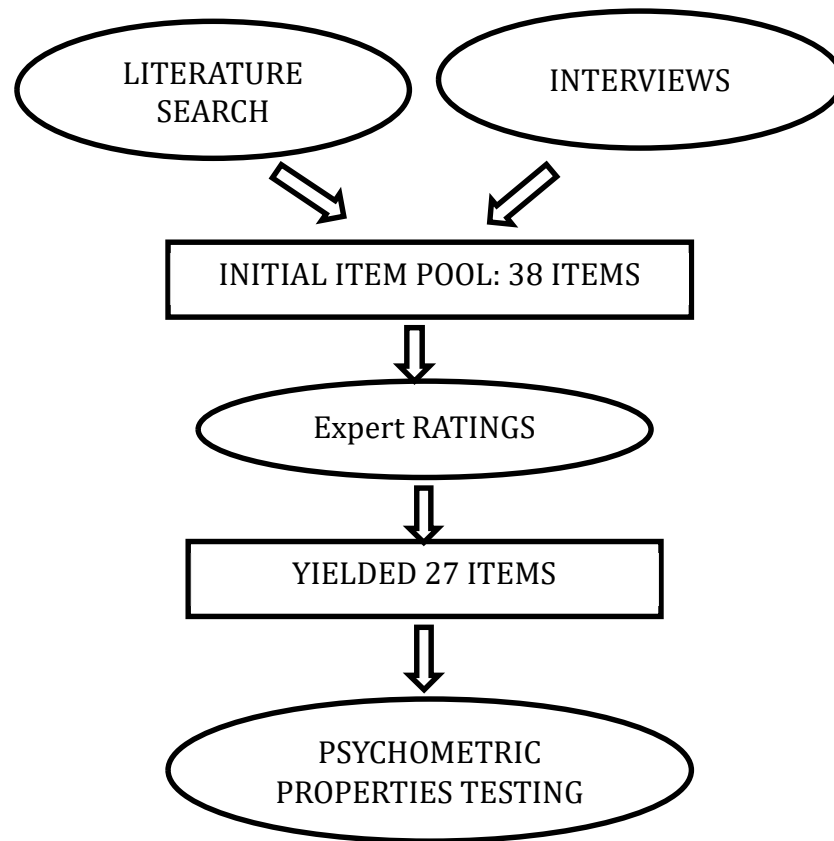


Figure 1: Procedure applied for the study

1. *Scale Development*

Literature Review

First, we carried out a literature review on data fabrication scales. Secondly, we conducted interviews. Initially, we embarked on an exhaustive literature review encompassing extant scales and scholarly works focused on data fabrication within academic settings. This comprehensive review served as a foundational framework for conceptualizing our research methodology and contextualizing the phenomenon of data fabrication.

One university and one college of education was used for the interview process. From the faculty of education in the university and the school of education in the college of education, we selected 15 academic staff using convenience sampling technique. Ten of them were from the faculty of education and five were from the school of education. The interviews were semi-structured, allowing for a flexible yet focused discourse that facilitated the exploration of participants' perspectives on data fabrication. This approach enabled us to maintain a semblance of structure while affording participants the latitude

to articulate nuanced insights and experiences. The interviews were conducted by a team of trained researchers well-versed in qualitative research methodologies. Each participant engaged in a single interview session, conducted in a formal setting conducive to open dialogue and intellectual exchange. The interview protocol comprised a multi-dimensional array of questions designed to elicit diverse insights. The format encompassed basic descriptive queries, experiential narratives, follow-up probes, and comparative analyses, as delineated by Alordiah et al. (2023) and Ghayas et al. (2022), to facilitate a comprehensive exploration of the factors precipitating data fabrication among academic staff. After the interviews, trained transcribers meticulously transcribed the recorded responses verbatim. The transcripts were then subjected to a rigorous qualitative data analysis, specifically employing the method of constant comparison as elucidated by Alordiah et al. (2023). To explicate the process of thematic analysis, we meticulously followed the guidelines delineated by Falaye (2018). Initially, individual responses were coded to capture singular ideas or concepts. Subsequently, codes manifesting analogous themes or ideas were systematically clustered to formulate categories. Interrelated categories merged into main themes that captured the predominant factors contributing to data fabrication among academic staff within the selected institutions.

With the information from the literature review and the results from the thematic analysis we developed a 38-item scale. As much as possible we retained the words and phrases from the interview data. Expert rating of the 38 items was done. Twenty-two respondents were selected through purposive sampling techniques to take part in the rating exercise. These 22 respondents consist of experts in scale constructions and senior faculty offices. We sent the new scale to them through email/WhatsApp. The respondents were asked to determine the importance (very important=4, important=3, somewhat important=2, and not important=1) and adequacy (very adequate=4, adequate=3, slightly adequate=2, and not adequate=1) of the scale's items. The number of items in the scale was reduced to 27 based on the responses of the experts. It was the 27 items retained in the Causes of data fabrication scale (CDFS) that was subjected to item analysis to determine the psychometric properties of the scale.

2. *Procedure for Psychometric Properties Testing*

In order to provide the psychometric properties of the new scale the following steps were taken. Two studies were conducted to present the psychometric properties of the new scale. In the first study we employed Principal Component Analysis. It was used to establish the factor structure of the new scale. The second study was later done to confirm these factors. Different samples were used for each of the studies.

3. *Participant*

First study- Principal Components Analysis (PCA)

The participants in this study are lecturers in education at Delta State universities and colleges of education. Delta State has five universities and three colleges of education. Only two of the universities provide education programmes. As a result, the study's participants were confined to the state's two universities and two colleges of education. Random sampling was used to select 50 lecturers from each of the two universities and 30 lecturers from each of the two colleges of education. A total of 160 education lecturers were included in the study. However, due to the response rate on the CDFS, the sample size was reduced to 143 lecturers. There were 85 female lecturers (59.44 %) and 58 male lecturers (40.56 %) in the sample. The number of university lecturers was 93 (65.04 %), whereas the number of lecturers from colleges of education was 50 (34.96 %). Over 52% of the lecturers were PhD holders. We used the sample for the PCA.

Second study- Confirmatory Factor Analysis (CFA)

The participants were drawn from the same universities and colleges of education used for the first study. However, we excluded the lecturers that took part in the first study. A total of 157 lecturers were sampled but only 139 of them returned their questionnaire. Among which were 72 (51.79%) females and 67 (48.21%) males. This sample was used to conduct the CFA.

4. *Instrument*

The instrument for this study is the "Causes of data fabrication scale" (CDFS). It contains 27 items. Each item was responded to in one of the options provided: strongly agree (SA) with three points, agree (A) with two points, disagree (D) with one point, and

strongly disagree with zero point. This instrument was used for both the first and second study.

5. Procedure for Data collection

The survey was administered to the participants by research assistants. First and foremost, we sought permission from the faculties/schools of education at the institutions we used. The questionnaire took the participants approximately 10 minutes to complete. The research assistants advised the participant that completing and submitting the questionnaire implied informed permission to participate in the study.

6. Data Analysis

The SPSS and R software was used for all statistical analyses. The test for sample adequacy analysis was done first. We carried out a principal component analysis with varimax rotation. It was done to identify the components that existed in the data. A confirmatory factor analysis was done to authenticate the factor structure and provide evidence of scale reliability and validity (Goh & Blake, 2021; Rajah-Kanagasabai & Roberts, 2015). Structural equation modelling was also done to validate the outcome. To estimate the fit of the models, several fit indices – the ratio of chi-square to its degrees of freedom (χ^2/df), the comparative fit index (CFI) the Tucker-Lewis fit index (TLI), and the root mean square error of approximation (RMSEA) – were used. To have a good fit, these indices should have values of less than three for the χ^2/df , above 0.90 for CFI and TLI, and below 0.06 for the RMSEA (Alordiah & Chenube, 2023; Goh & Blake, 2021; F. Hair Jr et al., 2014).

Results

1. Sample adequacy and Model fit

The Kaiser-Meyer-Olkin (KMO) measure of sample adequacy index was conducted and presented an index of 0.83. The second test, Barlett's test of sphericity, had a significant result of $\chi^2 = 2971$, $p < .001$. These two indicators showed that the sample and correlation matrix were within an acceptable range for the analysis.

2. Content validity

The findings revealed that all the items in the CDFS covered up to 65.30% of the domain of the attribute “Causes of data fabrication in educational studies”. The cumulative eigenvalue of 65.30% item coverage of the unidimensionality trait of CDFS is above 50%. Therefore, the CDFS has content validity (Alordiah, 2019).

3. Underlying factors and item loading

Five underlying factors can explain 65.30 % of the item variation with an eigenvalue larger than one (See Table 1 and Figure 2). The ‘Researchers factor’ representing the curses related to the researchers was the top factor, accounting for 18.69 % variation. The second factor was titled ‘Institution factor’, and it explained 18.23% of the overall variation. This factor assesses the causes of data fabrication concerning the researcher's institution, the society and journal to which he is submitting the work, and the government. The third factor, the ‘respondents factor’, explained 13.87 %. It examined the variables that led to researchers fabricating data due to respondents’ and research assistant’s activities. The fourth factor, dubbed the ‘funding/resources factor’, explained 7.43 % variations. It asked the researchers about the causes of data fabrication that is related to availability of funds and resources. The fifth and final factor, ‘research competency’, assesses the reasons for data fabrication due to the researcher’s knowledge of the research process.

Table 1: Pattern/structure coefficients of items contained within each underlying factor and their score-reliabilities

| Code | Indicator Statement | Factors | | | | | Reliability | |
|----------|---|---------|------|---|---|---|-------------|----------|
| | | 1 | 2 | 3 | 4 | 5 | α | ω |
| Factor 1 | Researchers factor | | | | | | .813 | .819 |
| RF1 | Laziness on the part of the researcher | .360 | | | | | | |
| RF2 | The heavy workload of the researcher | .620 | | | | | | |
| RF3 | The desire to have fame | .735 | | | | | | |
| RF4 | The habit of always wanting to succeed through illegitimate means | .573 | | | | | | |
| RF5 | The desire to acquire promotion | .450 | | | | | | |
| RF6 | The desire for monetary reward | .568 | | | | | | |
| RF7 | The attitude of always wanting to cut corners | .619 | | | | | | |
| Factor 2 | Institution factor | | | | | | .812 | .829 |
| I1 | Publish or perish syndrome (pressure on researchers to publish) | | .261 | | | | | |
| I2 | Impact factor stress | | .604 | | | | | |
| I3 | Lack of restraining by the researcher institution | | .719 | | | | | |

| Code | Indicator Statement | Factors | | | | | Reliability | |
|----------|--|---------|-------|-------|-------|------|-------------|----------|
| | | 1 | 2 | 3 | 4 | 5 | α | ω |
| I4 | Lack of institution policies to tackle scientific misconduct | | .762 | | | | | |
| I5 | Unavailability of equipment/materials/facilities to carry out the research | | .704 | | | | | |
| I6 | Article reviewers/journal owners are requesting non-realistic additional information | | .600 | | | | | |
| Factor 3 | Respondent factor | | | | | | .771 | .773 |
| R1 | Lack of willingness of the respondents to take part in the research | | | .560 | | | | |
| R2 | It is not easy to have access to the respondents | | | .615 | | | | |
| R3 | Low remuneration to fieldworkers/research assistance | | | .580 | | | | |
| R4 | The pressure placed on research assistance/fieldworkers to meet the deadline | | | .627 | | | | |
| R5 | The respondent attitude of faking their responses (not stating issues exactly the way it is) | | | .570 | | | | |
| Factor 4 | Funding/Resources | | | | | | .855 | .859 |
| F1 | The limited time to carry out data collection | | | | .706 | | | |
| F2 | Insufficient funds to complete the research | | | | .753 | | | |
| F3 | Poor funding of research by funding agencies | | | | .693 | | | |
| F4 | Competition for grants | | | | .694 | | | |
| F5 | Lack of resources for proper data collection | | | | .613 | | | |
| Factor 5 | Research competency | | | | | | .804 | .808 |
| P1 | Inability to prepare a standardized questionnaire | | | | | .556 | | |
| P2 | The researcher is not grounded in the research process | | | | | .644 | | |
| P3 | Inability to administer research instruments | | | | | .611 | | |
| P4 | Lack of management skills to handle the process of data collection | | | | | .661 | | |
| | FACTOR 1 | 1 | | | | | | |
| | FACTOR 2 | .868 | 1 | | | | | |
| | FACTOR 3 | .826* | .690* | 1 | | | | |
| | FACTOR 4 | .828* | .685* | .907* | 1 | | | |
| | FACTOR 5 | .907* | .784* | .759* | .841* | 1 | | |

α = Cronbach's α , ω = McDonald's ω , * $p < 0.01$

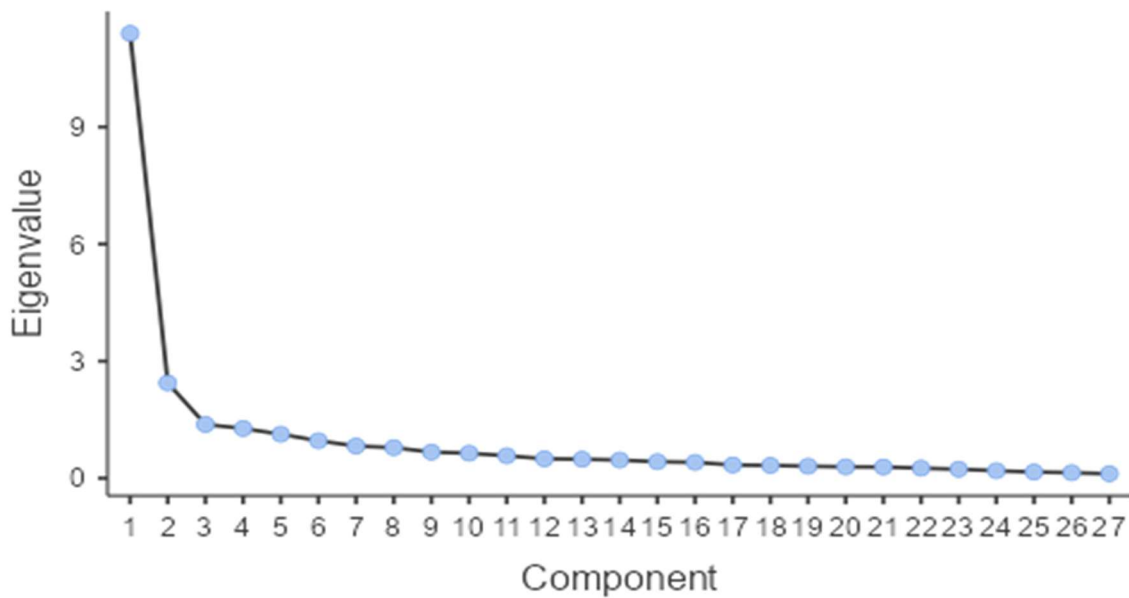


Figure 2: Scree plot for CDFS

Factor 1 contains seven items, Factor 2 contains six items, and Factor 3 contains five items. Factors 4 and 5 were loaded with five and four items, respectively. A typical criterion was an appropriate factor loading equal to or higher than .35. (Meza & González, 2020). All the items loaded above .35 except for the first item in Factor 2 (.26). The item correlation of this item with the other items in factor two was examined. The correlation ranges from .12 to .33 (see Figure 3). It was considered as ranging between mild and moderate. Also, the correlation was significant at .001.

4. *Construct validity*

The rotated factors loading vary from 0.36 to 0.76 was significant at $\alpha < .001$ except for the first item in factor 2 (see Table 2). These values indicate that the items in the scale were related and contribute to the construct being measured. Therefore, the CDFS has significant construct-related validity (Alordiah, 2019).

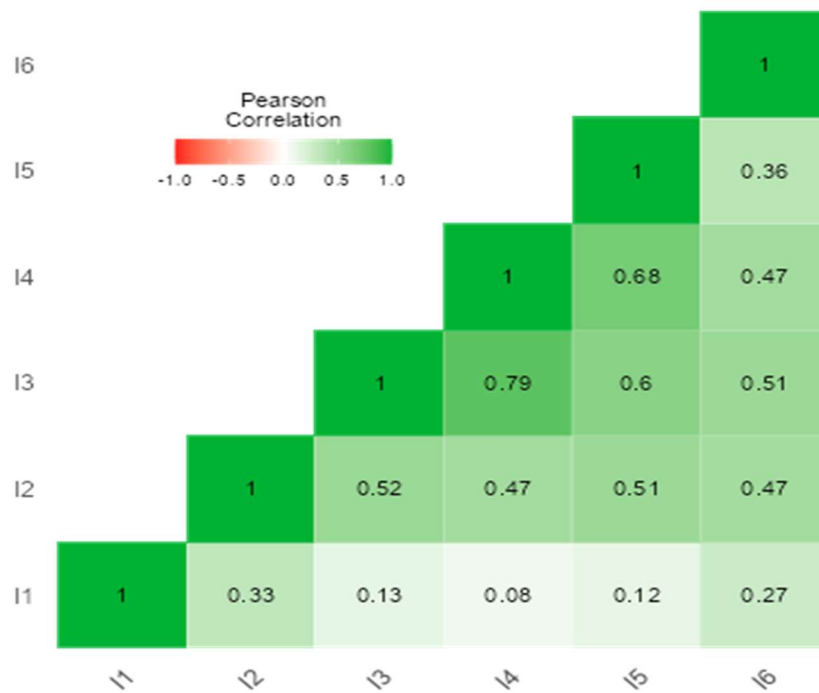


Figure 3: Correlation Heatmap of factor two

5. Reliability

All variables have a substantial positive reliability, with values ranging from .685 to .907 (Table 2). These correlations indicate unidimensionality of the scale. Finally, Cronbach's alpha and McDonald's omega coefficients were used to calculate the internal consistency reliability of each component. The coefficients derived from both approaches are consistent, indicating that the sample has a high level of reliability. Factor 4 (Funding/resources) has the highest reliability (.859). Factor 3 has the lowest reliability (.771) (Respondent factor). Table 2 contains the complete results for the internal consistency of the factors.

6. Second study- Confirmatory Factor Analysis

All the fit statistics indicated an acceptable model fit of the data (Goh & Blake, 2021). See Table 2.

Table 2: Model fit for CDFQ

| Model | Model fit | | | |
|-------------------|-------------|------|------|-------|
| | χ^2/df | CFI | TLI | RMSE |
| Measurement model | 2.89 | 0.93 | 0.91 | 0.058 |
| Structural model | 2.82 | 0.93 | 0.91 | 0.057 |

Table 2 presents the model fit indices for the CDFQ, which was assessed using Confirmatory Factor Analysis (CFA). CFA is a statistical technique used to evaluate how well the observed data fit a hypothesized measurement model. The first set of results pertains to the measurement model. For χ^2/df (Chi-square to degrees of freedom ratio), a value of 2.89 indicates that for each degree of freedom in the model, there is a chi-square value of 2.89. Typically, values less than 3 are considered indicative of a good fit, suggesting that the observed data align reasonably well with the model's expectations, despite the chi-square being statistically significant. The CFI value of 0.93 slightly exceeds the commonly recommended threshold of 0.90, indicating a good fit of the model to the data (Alordiah, 2022). The CFI compares the fit of the hypothesized model to a baseline model, with higher values suggesting better fit. Similarly, the TLI value of 0.91 also surpasses the acceptable threshold of 0.90, further corroborating that the model fits the data adequately. TLI, like CFI, evaluates the fit of the model concerning a null or baseline model. With a value of 0.058, the RMSE falls below the recommended threshold of 0.08, indicating a close fit of the model to the data. RMSE provides an index that measures how well the model fits the population covariance matrix.

The second set of results relates to the structural model, which goes beyond the measurement model by also considering relationships between latent variables or factors. The χ^2/df value of 2.82, which is slightly lower than that of the measurement model, continues to suggest a reasonably good fit to the data. Consistent with the measurement model, the CFI remains at 0.93, signifying a robust fit. The TLI also maintains its value at 0.91, supporting the adequacy of the structural model. With an RMSE of 0.057, the structural model continues to demonstrate a close fit to the observed data. Both the measurement and structural models exhibit favourable fit indices, suggesting that the hypothesized models align well with the observed data. These results offer empirical support for the validity and reliability of the CDFQ as a measurement instrument, indicating its suitability for subsequent research applications or theoretical investigations.

7. Model

Figure 4 displays the confirmatory factor analysis of the measurement model, revealing that the CDFS is described by five factors retrieved using principal component factor analysis. The items loading on the same factors they loaded on in Table 2.

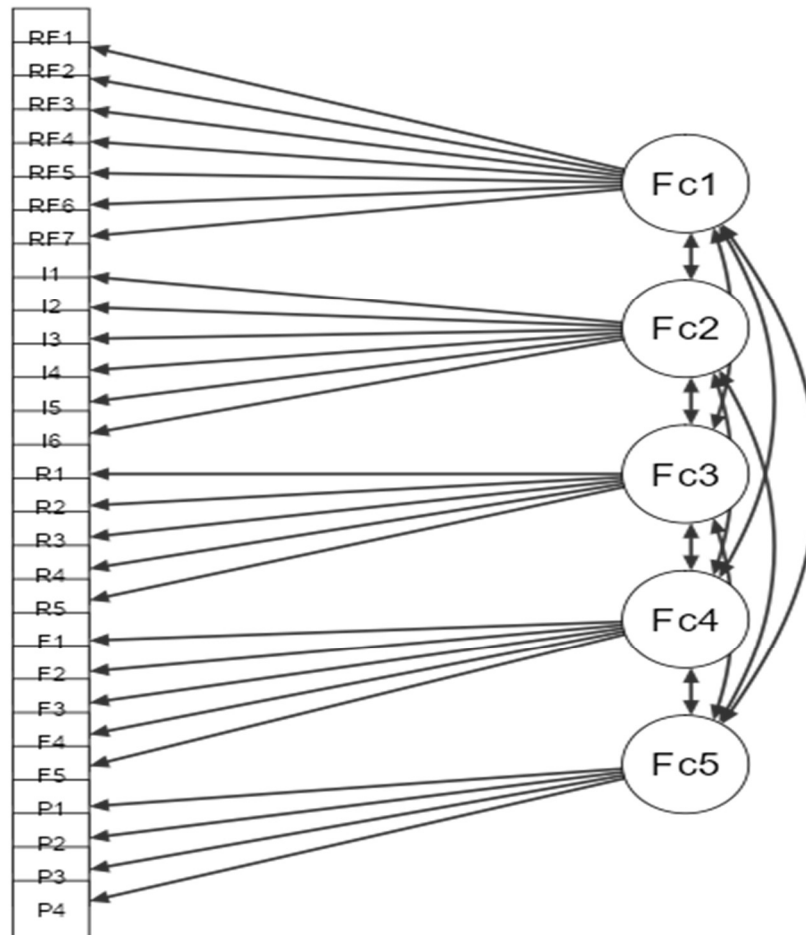


Figure 4: Measurement model

Note: Circles represent factors, rectangle represent observed variables/items, Fc1= Researchers factor, Fc2= Institution factor, Fc3= Respondents factor, Fc4= Funding/resources, Fc5= Research competency

Figure 5 shows a final structural equation model with standardized coefficients on the structure routes after confidence in the measurement model has been established. Because of the recognized degree of fit based on CFI, TLI, and RMSEA indices, the measurement model (Figure 4) and structural model (Figure 5) are accepted (see Table 2). Furthermore, all of the items significantly loaded on the corresponding latent construct.

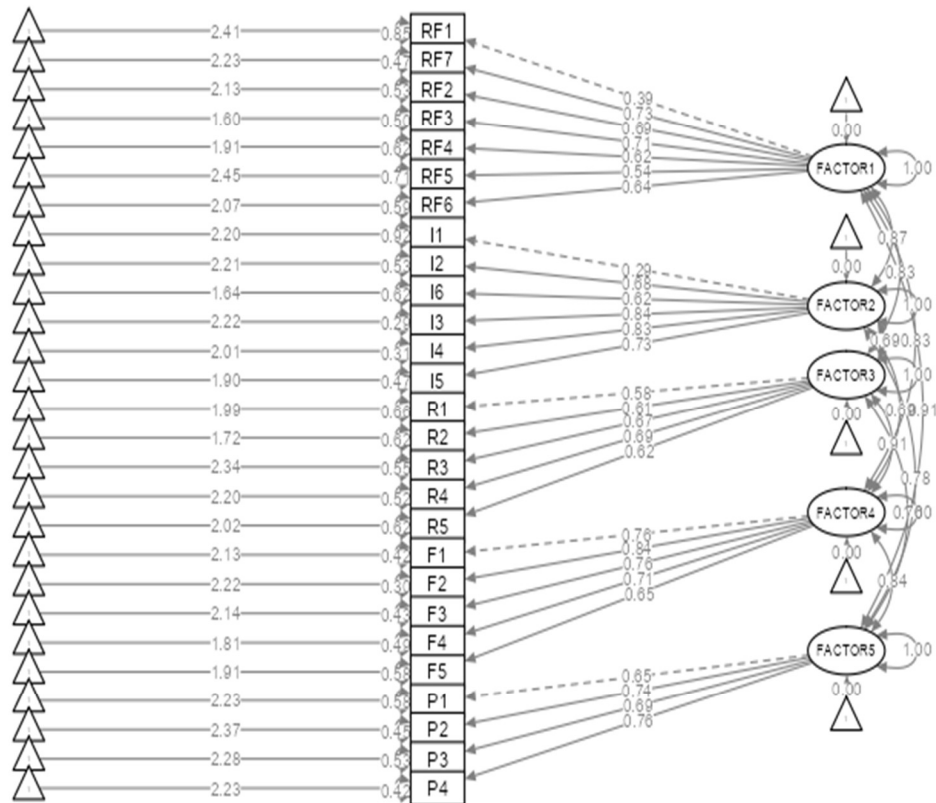


Figure 5: Structural equation model of CDFS

Note: Ellipses represent factors, rectangles represent items, triangles represent error variance.

Discussion

The goal of this study was to develop and validate a scale – namely, the Causes of Data Fabrication Scale – for determining the causes of data fabrication. According to the literature review (Broome et al., 2005; Hadji et al., 2016; John et al., 2012; Khadem-Rezaiyan & Dadgarmoghaddam, 2017; Khajedaluae et al., 2019; Rankin & Esteves, 1997; Shamsoddin et al., 2021), some scales measured the prevalence and causes of research misconduct but there seem to be no scale that solely measured the causes of data fabrication. The preliminary instrument was made up of 38 items. Expert judges were

used to determine the proposed instrument's content validity and the appropriateness and relevance of the items. The number of elements on the scale was reduced to 27 based on their reports.

The 27 items and five factors were examined for construct validity using principal component factor analysis and confirmatory factor analysis. The suggested scale had five factors: a) Researchers factor (7 items), b) Institution factor (6 items), c) Respondents factor (5 factors), d) Funding/Resources (5 items), and e) Research Competence (4 items). The correlations between factors 1 to 5 suggest that the various parts of the scale for data fabrication causes are associated. This finding implies that the five factors contributing to the data fabrication scale have a significant relationship (Meza & González, 2020). It is an indication that all the factors are measuring the same construct but from several directions. The item 'Publish or perish' syndrome loaded into factor 2 with a factor loading of (.26) which was below the benchmark of .35 used for this study. However, we decided to retain this item because of its relevance as stated in literature (Bouter et al., 2016; Tjindik et al., 2014) and the reports of the expert judges. This item can be addressed in future studies.

Although the suggested scale appears to have good content and construct validity, researchers must continue evaluating and contrasting its use in different populations and circumstances while also including independent criterion validity and stability reliability assessments. As a result, the suggested instrument would enable researchers to look into the causes of data fabrication in many areas of education. Second, postgraduate, undergraduate, and free-license education researchers can be evaluated based on their perceptions of data fabrication causes. This scale can also be adjusted to fit various fields of study. These are only a few ways the suggested scale can be used.

While the sample was sufficient to validate the instrument, the sample did not sufficiently cover Nigeria, which is one of the work's shortcomings. Private universities were not included in the sample. It was limited to two universities and two colleges in Delta State, Nigeria. Replicating the study on a broader sample, including postgraduate, undergraduate, and free license researchers is necessary. A further in-depth investigation can be conducted to determine the complexity and discrimination level of the scale's items. Adopting the item response theory model to the scale will aid in improving the scale's validity.

Conclusion

The purpose of this research was met, as an instrument that yields a reliable and valid score-measure for the causes for data falsification in education was developed. As a result, the study has helped close a knowledge gap that occurred in prior studies. To put it simply, researchers need an instrument that will allow them to accurately and reliably detect the causes of data fabrication. This idea is a significant step forward in searching for the root causes of data fabrication in educational research.

References

- Alordiah, C. O., & Chenube, O. (2023). Item Rotation in Scale Development: Exploring Principles and Strategies for Improving Scale Validity and Interoperability through Factor Analysis. *Nigerian Journal of Social Psychology*, 6(2), 65-82. Retrieved from <https://nigerianjsp.com/index.php/NJSP/article/view/100>
- Alordiah, C. O., Tibi, P. I., Omumu, F. C., Chenube, O., Moemeke, C. D., & Okokoyo, I. E. (2023). Qualitative research: a future road map for educational researchers in Nigeria. *University of Delta Journal of Contemporary studies in Education (UDJCSE)*, 2(2), Available at <https://foeunidel.org.ng/edu/2023/09/30/17/>
- Alordiah, C. O. (2022). An examination of the latent constructs in a well-being scale for children: Application of Rasch Model. *University of Delta Journal of Contemporary Studies in Education*, 1(2), 39-57.
- Alordiah, C. O. (2019). Development and factorial validation of a wellbeing scale for the Nigerian child. *The Educational Psychologist*, 13(1), 1-12.
- Bouter, L. M., Tijdink, J., Axelsen, N., Martinson, B. C., & ter Riet, G. (2016). Ranking major and minor research misbehaviors: Results from a survey among participants of four World Conferences on Research Integrity. *Research Integrity and Peer Review*, 1(1), 17. <https://doi.org/10.1186/s41073-016-0024-5>
- Broome, M. E., Pryor, E., Habermann, B., Pulley, L., & Kincaid, H. (2005). The Scientific Misconduct Questionnaire--Revised (SMQ-R): Validation and psychometric testing. *Accountability in Research*, 12(4), 263-280. <https://doi.org/10.1080/08989620500440253>

- Dal-Ré, R., & Ayuso, C. (2021). For how long and with what relevance do genetics articles retracted due to research misconduct remain active in the scientific literature. *Accountability in Research*, 28(5), 280–296. <https://doi.org/10.1080/08989621.2020.1835479>
- F.Hair Jr, J., Saratedt, M., Hopkins, L., & Kuppelwieser, V. (2014). Partial least squares structural equation modeling (PLS-SEM): An emergent tool in business in business research. *European Business Review*, 26(2), 106-121. <https://doi.org/10.1108/EBR-10-2013-0128>
- Falaye, F. V. (2018). Qualitative research and evaluation. Ibadan University Press.
- Freitas, J., Esteves, D., & Neiva, H. (2021). A narrative on the fabrication of results in science. *CURRENT SCIENCE*, 121(2), 5.
- Gaspar, D. E. P., & Esteves, M. D. L. (2021). Awareness of the Misconduct in Sports Science Research. *Annals of Applied Sport Science*, 9(3), 0–0. <https://doi.org/10.52547/aassjournal.934>
- Ghajarzadeh, M., Mohammadifar, M., & Safari, S. (2013). Introducing Plagiarism and Its Aspects to Medical Researchers is Essential. *Anesthesiology and Pain Medicine*, 2(4), 186–187. <https://doi.org/10.5812/aapm.9903>
- Ghayas, S., Hassan, Z. F., Kayani, S., & Biasutti, M. (2022). Construction and Validation of the Research Misconduct Scale for Social Science University Students. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.859466>
- Goh, P. S. C., & Blake, D. (2021). E-readiness measurement tool: Scale development and validation in a Malaysian higher educational context. *Cogent Education*, 8(1), 1883829. <https://doi.org/10.1080/2331186X.2021.1883829>
- Hadji, M., Asghari, F., Yunesian, M., Kabiri, P., & Fotouhi, A. (2016). Assessing the Prevalence of Publication Misconduct among Iranian Authors Using a Double List Experiment. *Iranian Journal of Public Health*, 45(7), 897–904.
- John, L. K., Loewenstein, G., & Prelec, D. (2012). Measuring the Prevalence of Questionable Research Practices with Incentives for Truth Telling. *Psychological Science*, 23(5), 524–532. <https://doi.org/10.1177/0956797611430953>
- Kang, E., & Hwang, H.-J. (2020). The Consequences of Data Fabrication and Falsification among Researchers. *Journal of Research and Publication Ethics*, 1(2), 7–10. <https://doi.org/10.15722/jrpe.1.2.202009.7>

- Khadem-Rezaiyan, M., & Dadgarmoghaddam, M. (2017). Research Misconduct: A Report from a Developing Country. *Iranian Journal of Public Health*, 46(10), 1374–1378.
- Khajedaluae, M., Moghaddas, F., & Dadgar Moghaddam, M. (2019). Reconstruction and assessment of validity and reliability of Perceptions, attitude and behavior research misconduct questionnaire and underling factor. *Medical Journal of Mashhad University of Medical Sciences*, 62(4), 1581–1586. <https://doi.org/10.22038/mjms.2019.14255>
- Kuroki, T. (2018). New Classification of Research Misconduct from the Viewpoint of Truth, Trust, and Risk. *Accountability in Research*, 25(7–8), 404–408. <https://doi.org/10.1080/08989621.2018.1548283>
- Laskar, M. (2017). Publishing articles in scientific journals: A concern for research misconduct or dishonesty (fabrication, falsification and plagiarism). *Mediscope*, 4, 1. <https://doi.org/10.3329/mediscope.v4i2.34995>
- Meza, P., & González, M. (2020). Construction and validation of the self-efficacy scale for disciplinary academic writing. *Cogent Education*, 7(1), 1830464. <https://doi.org/10.1080/2331186X.2020.1830464>
- Nurunnabi, M., & Hossain, M. A. (2019). Data falsification and question on academic integrity. *Accountability in Research*, 26(2), 108–122. <https://doi.org/10.1080/08989621.2018.1564664>
- Omumu, F. C., Chenube, O., & Alordiah, C. O. (2022). Low Utilisation of Online Research Resources by Lecturers: Causes and Remedies. *Information and Knowledge Management*, 12(4), 1-8
- Poutoglidou, F., Stavrakas, M., Tsetsos, N., Poutoglidis, A., Tsentemidou, A., Fyrmpas, G., & Karkos, P. D. (2022). Fraud and Deceit in Medical Research. *Voices in Bioethics*, 8. <https://doi.org/10.52214/vib.v8i.8940>
- Rajah-Kanagasabai, C. J., & Roberts, L. D. (2015). Predicting self-reported research misconduct and questionable research practices in university students using an augmented Theory of Planned Behavior. *Frontiers in Psychology*, 6, 535. <https://doi.org/10.3389/fpsyg.2015.00535>
- Rankin, M., & Esteves, M. D. (1997). Perceptions of scientific misconduct in nursing. *Nursing Research*, 46(5), 270–276. <https://doi.org/10.1097/00006199-199709000-00005>

- Shamsoddin, E., Torkashvand-Khah, Z., Sofi-Mahmudi, A., Janani, L., Kabiri, P., Shamsi-Gooshki, E., & Mesgarpour, B. (2021). Assessing research misconduct in Iran: A perspective from Iranian medical faculty members. *BMC Medical Ethics*, 22(1), 74. <https://doi.org/10.1186/s12910-021-00642-2>
- Stacey, A. (2016). Militating against data fabrication and falsification: A protocol of trias politica for business research. *Electronic Journal of Business Research Methods*, 14(2), pp72-82-pp72-82.
- Tijdink, J. K., Verbeke, R., & Smulders, Y. M. (2014). Publication Pressure and Scientific Misconduct in Medical Scientists. *Journal of Empirical Research on Human Research Ethics*, 9(5), 64–71. <https://doi.org/10.1177/1556264614552421>

The Impact of Financial Challenges on the Attrition of Black African Students in South African Universities

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Abstract: Higher education plays a pivotal role in the socioeconomic advancement of individuals and societies, yet attrition rates among Black African students in South African universities remain disproportionately high. This paper explores the multifaceted relationship between financial obstacles and attrition among Black African students. Drawing on Maslow's Hierarchy of Needs theory, the study explores how financial challenges contribute to the attrition rate of Black African students. Using a qualitative approach, the study sought to unveil the complex dynamics underlying the persistence of financial obstacles among Black African students. An interview schedule was used to comprehend the impact of these obstacles on students' educational journeys and ultimate attrition. The findings from this study reveal that financial constraints prevent Black African students from meeting basic needs, leading to academic struggles and high dropout rates. These challenges, framed by Maslow's Hierarchy of Needs, hinder students' ability to achieve academic success and personal growth. The study recommends improving financial support systems, including addressing the "missing middle" and providing comprehensive aid to ensure Black African students meet their basic and academic needs.

Keywords: Attrition, University, Financial Obstacles, Black African

Introduction

Black African students at South African universities face substantial financial difficulties that markedly impact their academic achievement and general wellbeing (Chiramba & Ndofirepi, 2023). These challenges are exacerbated by increasing student debt and the "missing middle" status of those students who hail from middle-class families, do not qualify for financial help, yet they cannot afford university expenses (de Wet, 2022). Although the National Student Financial Aid Scheme (NSFAS) aims to assist financially disadvantaged students, its effectiveness is frequently compromised by structural challenges, including corruption and mismanagement, culminating in insufficient support for many students (Matyana, 2023). Financial limitations hinder students' access to affordable accommodation and restrict their involvement in extracurricular activities which are essential for promoting engagement and improving academic performance (Naik & Wawrzynski, 2018; Pretorius & Blaauw, 2020). These economic demands adversely affect students' subjective wellbeing, and eventually militate against academic persistence. Notwithstanding these challenges, many economically disadvantaged students in higher education institutions tend to display extraordinary resilience and determination to succeed (Chiramba & Ndofirepi, 2023). To address these challenges, universities are encouraged to enhance student involvement in funding discussions, prioritise initiatives that foster resilience among students, and establish targeted student support systems that advance equitable and inclusive interventions (Chiramba & Ndofirepi, 2023; Pretorius & Blaauw, 2020).

In addition, financial hardships and extensive social inequalities are among the dominant factors contributing to student attrition in South African universities. Students from poor socioeconomic backgrounds are often incapacitated by inadequate academic preparation, culminating in poor performance and higher dropout rates (Tanga & Maphosa, 2018). Participation estimates indicate that merely 16% of Black African students aged 20-24 were enrolled in public universities, in contrast to 55% of White students (Calitz, 2018). While poverty is frequently framed as financial deprivation, it is in fact a multidimensional issue, encompassing unmet basic needs, lack of learning resources, inadequate living arrangements, limited participation in university life, and compromised psychological wellbeing (Ruswa & Gore, 2021). These deprivations are intensified by intersecting factors such as race, class, sexuality, and religion, which

aggravate structural inequities in higher education. Financial constraints adversely affect academic performance and restrict students' participation in co-curricular activities, which can negatively affect their learning outcomes (Naik & Wawrzynski, 2018).

Navigating the above difficulties demands more than mere financial assistance. While funding is essential, universities must also consider initiatives such as mentorship programmes to reduce psychological stress and stigma among economically disadvantaged students. By adopting a holistic approach to alleviating these challenges, higher education institutions can work to improve retention rates and create a more inclusive environment for Black African students (Ruswa & Gore, 2022). It is against this background that this study seeks to explore the financial challenges that Black African students encounter in South African universities. It aims to answer three critical research questions:

1. What are the primary financial challenges faced by Black African students in South African higher education institutions?
2. How do financial challenges contribute to student attrition among Black African students in South African universities?
3. How do financially challenged Black African students navigate financial constraints?

Literature Review

Financial constraints create significant barriers for Black African students pursuing higher education, particularly in developing countries including South Africa. These include, but are not limited to high tuition fees, limited access to financial aid, and additional financial burdens on families (Carpenter & Roos, 2020). This diversity of challenges severely impacts students' ability to succeed academically (Pillay et al., 2021). Research shows that universities, particularly those in developed countries, often gazette high tuition fees that are unaffordable for students from economically disadvantaged backgrounds (Carpenter & Roos, 2020; Mngomezulu et al., 2017). South Africa is not exempted from this trend. Many Black African students hail from families with limited financial resources, making higher education an enormous financial strain (Deventer & Klerk, 2016; Dominguez-Whitehead, 2017). The financial burden includes tuition fees and

the cost of accommodation, textbooks, and basic living expenses, which are all essential for academic success (Carpenter & Roos, 2020).

Poverty exacerbates the above challenges by limiting access to academic resources such as reliable internet, computers, and libraries, which constitute important resources for learning (McKay et al., 2018). Students often experience anxiety and stress because of financial strain, which affect their academic performance and overall wellbeing (Matsolo et al., 2016). To cope, some students take on part-time jobs or loans, which further detract from their focus on studies (McKay et al., 2018). Additionally, the stigma of poverty undermines students' self-esteem and confidence, compounding their academic struggles (Cornell & Kessi, 2017). Ndofirepi (2023) These financial pressures culminate in anxiety and stress, often forcing students to drop out. Research shows that poverty disproportionately affects students of colour in South Africa, contributing to alarmingly high dropout rates (Pretorious & Blaaw, 2020; Tanga & Maphosa, 2018).

The multidimensional nature of poverty manifests in severe deprivation, which includes inadequate access to food and basic needs. These negatively impact students' academic performance (Cele, 2018; Dominguez-Whitehead, 2017). For example, socio-economic challenges erode students' confidence and motivation. This is particularly the case in resource-constrained settings such as township schools. Despite introducing the National Student Financial Aid Scheme (NSFAS) to alleviate financial burdens for families earning less than R350,000 per annum (DHE, 2016), many students remain susceptible to exclusion for financial reasons. Delayed disbursement of NSFAS funds often forces students to terminate their studies, coupled with instances of harassment and credit bureau blacklisting for unpaid fees (Ruswa & Gore, 2022). This highlights the urgent need for systemic reforms to address Black African students' financial and social challenges in South African higher education institutions.

Theoretical Framework

The study is framed by Abraham Maslow's Hierarchy of Needs theory. Maslow organises human needs into a five-level pyramid. The hierarchy begins with physiological needs (such as food, water, and shelter), followed by safety needs (security and stability), social belonging needs (relationships and a sense of community), esteem needs (self-respect and recognition), and finally, self-actualisation (realising one's full potential)

(Mastofa, 2022). Maslow argued that individuals must satisfy lower-level needs before focusing on higher-level ones (Wei & Ma, 2022). For example, a person struggling to meet basic survival needs will struggle to concentrate on personal growth or achieve their ambitions. This theory is widely used to understand human motivation and behaviour across various contexts, including education, workplace dynamics, and healthcare (Mastofa, 2022). The theory has been proposed as a solution to academic procrastination, suggesting that fulfilling students' basic needs can improve their academic performance (Muhibbin & Marfuatun, 2020).

In this study, Maslow's Hierarchy of Needs provided an invaluable lens for understanding Black African students' financial challenges in South Africa's higher education and their impact on student retention. According to Maslow, human needs are organised in a hierarchy, beginning with basic physiological needs (e.g., food, shelter, and clothing), progressing to safety, social belonging, esteem, and self-actualisation. For students to thrive academically and reach their full potential, their foundational needs must first be met. However, financial constraints often prevent Black African students from securing these necessities, creating barriers to their academic focus and participation (Rojas et al., 2023). This framework reflects the interconnected nature of human needs and highlights how unmet lower-level needs can hinder progress toward higher-level goals such as academic achievement (Febella, 2023). Financial challenges compromise students' ability to meet physiological and safety needs. Further, these challenges undermine students' sense of belonging and self-esteem. The stigmatisation of poverty, coupled with the constant struggle to survive can alienate students from their peers and institutions, inadvertently contribute to attrition (Muhibbin & Marfuatun, 2020). Using Maslow's theory, this article unpacks how financial challenges disrupt the educational pathways of Black African students, offering insights into the systemic barriers that prevent them from achieving academic success.

Methodology

This article analyses data obtained from the Education and Emancipation Project research, monitor students' progress during their academic enrolment period (four years). The qualitative data were collected using in-depth interviews, conducted by a

team of eight researchers. The data were derived from a restricted sample of students selected from eight universities across South Africa.

The researchers interviewed purposively selected student participants to understand the challenges they faced and the strategies they used by the students and their respective institutions to mitigate challenges. The sample comprised 66 Black African student participants purposively selected to participate in this research. The term Black African refers to a group of people who were formerly categorised as 'Black' under the apartheid regime (Cele, 2023). This demographic group were disadvantaged in almost all the important aspects of life including housing, healthcare, and education (Phadi, 2021). This racial group had certain features, including a historical experience of exploitation, oppression, racial segregation, and discrimination. Nevertheless, within the new democratic dispensation, initiatives were introduced to address the problem of racial classification in South Africa (Tewolde, 2019). Subsequently, the data were systematically categorised into themes that incorporated our interpretation. The iterative process of data analysis involved meticulous coding and categorisation using a nuanced approach to abstraction and theorisation (Braun & Clarke, 2012). Using an inductive approach fostered the development of new ideas, which helped to mitigate researcher bias in the presentation of data. The data interpretation process yielded trustworthy findings.

Data were analysed using thematic analysis as described by Braun and Clarke (2012). This framework served as a helpful guide. For example, the process entailed familiarisation with the data, generation of initial codes, searching for themes, the review of prospective themes, definition and naming of themes, and producing the final report. Transcripts were carefully examined and studied to interpret the interview questions and participants' responses. The data were revisited consistently during this iterative procedure in order to guarantee that a nuanced understanding of the phenomenon of interest was obtained.

Before beginning the coding process, the dataset was thoroughly examined to organise the data and gain meaningful insights. Through the completion of this preliminary stage, it was possible to recognise patterns throughout the data. After generating preliminary codes for each data subset, these codes were incorporated into a unified whole. The participants' responses were analysed to determine their similarities and differences, and then they were grouped into distinct topics or groups. The coding

process, which involved deconstructing, conceiving, and reorganising the data into new patterns and structures helped to produce thematic concepts (Neuman, 2006).

We maintained a high level of ethics to ensure that key ethics principles were not compromised. For example, all the participants provided informed consent before taking part in the study. Therefore, participation was voluntary since no coercion was used. To maintain anonymity and confidentiality, pseudonyms were used in the presentation of findings. For each participant, sex is indicated by the letters "F" for female and "M" for male, followed by a number representing their age, i.e. (Lonke, M, 23). The subsequent section is the presentation of findings.

Findings

This section presents the findings, focusing on the financial challenges encountered by Black African university students in South Africa. The findings highlight how these challenges contribute to student attrition. Our study aimed to explore students' experiences holistically without classifying responses based on gender. While we acknowledge that gender may play a role in shaping student experiences, the study's primary focus was on the broader financial constraints affecting student retention, rather than gender-based differences. Four themes emerged from the data analysis namely:

- Financial barriers to accessing and succeeding in higher education
- Financial exclusion: The plight of "missing-middle" students
- Financial hardship in meeting the basic needs of academic life
- Student resilience and resourcefulness in overcoming financial challenges

The presentation of findings entails verbatim extracts from the participants' narratives, which reflect the financial challenges faced by the students in South African universities. However, these excluded such nuances as pauses, filler words and stutters.

1. Financial Barriers to Accessing and Succeeding in Higher Education

During the one-on-one interviews, student participants were asked to define success as they understood it. Most participants associated success with financial stability. The findings also highlighted that some students viewed higher education as a tool to transform their economic circumstances and those of their families and communities. However, most participants emphasized that financial challenges

constituted a significant barrier to accessing higher education. They indicated that this challenge was particularly evident during the registration period at the beginning of the academic year when huge amounts of money were required. The experiences of participants such as Lonke, Hlelo, and Selu illustrate this challenge:

First and foremost, I hail from a very poor background. My mother is unemployed, and we survive on my younger sister's disability grant. Sadly, the only thing the Government social grant can afford is food. She cannot pay for my university registration fees (Lonke, M, 23).

Lonke's narrative highlights her family's impoverished circumstances, where even with a government social grant, her unemployed mother could not afford university registration fees. This struggle was not unique to Lonke, as other participants such as Hlelo and Selu shared their experiences of similar challenges:

Registration was a problem. I remember that it was hard. I almost failed register. In fact, I registered on the last day of the registration period. My mom went to a mashonisa (a loan shark) to access money for my registration fees. (Hlelo, F, 22).

Well, at first, I did not have NSFAS, so registration was a struggle. At that time, attending lectures was not important for me since my worry was to get registered, first. I got registered very late this year because I did not have the money for registration (Selu, M, 21).

These narratives underscore the critical role of financial resources in gaining access to higher education, yet they also reveal how financial barriers hinder the academic success of Black African students. Participants' experiences illustrate how unemployment and limited financial means can make university registration to be such a hurdle. For instance, Lonke's family survived on a social grant allocated to her disabled sibling while Hlelo's mother resorted to loan sharks to secure funds, and Selu's delayed registration reflected the lack of immediate financial support. Together, these accounts demonstrate the profound impact of financial instability on students' ability to begin and succeed in higher education.

2. *Financial Exclusion: The plight of “Missing Middle” Students*

The findings showed that South Africa’s higher education institutions such as universities can be intimidating spaces for many Black African students. Despite being academically capable and earning admission, some students lack access to financial aid schemes such as NSFAS. A group called the “missing middle” emerged as a phenomenon of interest among the student participants. These students are considered financially stable enough not to qualify for financial aid but too financially constrained to afford tertiary education (Swartz, 2018). NSFAS supports students deemed financially needy based on household income and family size among other factors. The findings show that many participants hailed from families that were not meeting NSFAS requirements, rendering higher education unaffordable. This reality is reflected in the experiences of Siya, Simthembile, and Themba:

Our parents are middle-class people. My sister is in the university, so am I. My other sister is at primary school; my other sister is in crèche. It’s a lot of money. They must pay rent, food, everything. The financial burden is too heavy for two basic salaries. The government needs to consider this (Siya, M, 23).

Despite being middle-class employee, Siya’s narrative highlights how his parents struggled to afford fees for two children and others at different stages of their education. Similarly, Simthembile faced comparable challenges, noting that his single mother, a primary school teacher, supported him and his four siblings on a single salary. He shared:

My mother is a primary school teacher. She is a single parent taking care of me and my four siblings. We are all still in school and depend on only one salary. My father is still alive, but he does not support us. He has another wife and children somewhere. I’m worried that I might drop out if my mother fails to settle the outstanding fees from last year (Simthembile, M, 21).

While Siya and Simthembile emphasised their parents’ incapacitation despite being employed, Themba expressed a different concern: the uncertainty about his mother’s financial stability. He reflected:

If my mother gets retrenched, I might not be able to continue studying at university anymore. She is the one responsible for my university fees since my father passed away (Themba, M, 22).

These narratives highlight the financial struggles faced by middle-class students who are excluded from government financial aid schemes such as NSFAS. Despite its existence, NSFAS does not cover all financially needy students, leaving many at risk of dropping out due to financial difficulties (de Wet, 2022; Chiramba & Ndofirepi, 2023). For instance, while Simthembile's mother has a stable job, supporting four children on a single income is nearly impossible. Similarly, Themba's fear of exclusion if his mother were to be retrenched underscores the fragility of these students' academic journeys. These experiences illustrate the profound distress and the financial challenges they face.

3. Financial Hardship in Meeting Basic Needs of Academic Life

The participants highlighted their experiences of exclusion from financial aid and shared their daily financial struggles on and off campus. Many participants reported difficulties related to meeting basic needs such as food, toiletries, transport, and academic materials and services such as books and printing credits. Accommodation and financial challenges were often intertwined, with students noting that without financial aid, it was nearly impossible to access university accommodation, which they perceived as expensive. Furthermore, the cost of travel was another significant obstacle to accessing university education. Commuting long hours on a daily basis, waking up early, and returning late at night were all part of the challenges. The following excerpts illustrate how students described these challenges:

I have used a book that cost ZAR700 (US\$39). I am currently doing seven modules, with five of them being year modules. I bought four books at a cost of ZAR3,000 (US\$166). It is a lot of money, I must say. I don't know what to do because I still need more books, but I don't have the money (Zukhy, F, 22).

Zukhy's inability to afford textbooks was an additional financial burden, negatively affecting her academic integration. Without access to necessary learning materials, her capacity to succeed academically was compromised. In addition to this, Babalo and Zolo discussed the struggles related to transport costs and commuting to campus:

I wake up at 04h00 and leave at 06h00. My day ends late, and at the same time, transport is expensive. Sometimes, I don't go to campus when I don't have money for transport (Babalo, M, 22).

Most of us, Black African students, did not get university accommodation, so we had to commute from our townships to campus. At the same time, we cannot afford to travel to campus daily. Public transport is expensive these days. Guys from other races get driven to and from campus by their parents, but we can only access public transport (Zolo, M, 21).

Sethu's experience was slightly different, as illustrated below:

Although I stay in a student residence, I sometimes struggle to buy food. The problem is that I cannot ask anything from home because I know there's no one working in our household. It's a struggle, we are poor. Sometimes, I sleep on an empty stomach, and I can't buy toiletries (Sethu, M, 21).

Sethu's experience reflects the difficulty in affording basic needs, such as food and toiletries, even while residing in a student residence. The overarching concern in these narratives is that gaining admission to university does not guarantee success, especially when students are not financially stable. Sethu's food insecurity, and the struggle to afford basic upkeep underscore the hardships that many students face. For Zolo, the challenge of commuting long distances, coupled with exorbitant transport costs were key obstacles, leading to fatigue and mental strain, which likely affected his focus on academic work. The broader issue of poverty compounds these challenges, and accommodation and financial difficulties are deeply interconnected. Sethu's comments about the high cost of travelling from townships to campus further reinforce this point. In contrast, students from more privileged backgrounds, as Zolo pointed out, are often driven to and from campus by their parents, highlighting a stark disparity.

4. *Student Resilience and Resourcefulness in Overcoming Financial Challenges*

The findings indicated that students used various strategies to cope with their financial challenges. Despite the unrelenting challenges, the students demonstrated resilience, developing innovative ways to navigate the maze of challenges and achieve academic success. Many participants reported taking part-time or casual jobs outside the university to generate additional income, which helped them meet their basic needs.

Some even resorted to selling various commodities to fellow students, while others who lived off-campus negotiated with friends to stay in residences, ensuring they were closer to campus. Sleeping in libraries for overnight study sessions became another viable solution for those commuting from home or without access to campus accommodation. These strategies were considered essential to alleviating students' financial pressures. The following excerpt illustrates how participants dealt with the diversity of challenges that confronted them:

To save transport money, I sometimes spend 24 hours in the library, particularly when I have tests the following day at 08h00. If I leave campus at 18h45 in the afternoon, I get home around 20h30. I must wake up at 04h00. Overall, I waste about four hours daily (Leki, M, 21).

Leki's strategy of spending the night in the library enabled him to save on transport costs, particularly during assessments. By staying on campus overnight, he maximised his time for studying while reducing the cost of commuting. However, Sethu's experience highlighted a different approach for many students who did not have access to university accommodation. He explained,

It's a big problem because in this residence, it seems there are 100 people squatting here. We had 23 rooms, but 15 of those rooms had squatters because the university does not have enough space to accommodate all the students. It's illegal, but we have to do it because we can't leave our brothers suffering. (Sethu, M, 22).

Sethu's account reveals how students who had no access to accommodation resorted to squatting in their friends' rooms, a strategy driven by a sense of solidarity and community. Despite the university's policies against this practice, students felt compelled to support one another, showing the spirit of unity and resilience. Cici's approach to overcoming financial challenges was different, yet equally resourceful:

During weekends, I work as a waitress at a local restaurant near my hometown. I do it to generate my transport fees. It affects my studies, but I've learnt to juggle things. You must be strong, especially when you're Black and poor (Cici, F, 23).

Cici's part-time job helped her cover generate money to cushion her transport costs, although she acknowledged that balancing work and study could negatively affect her academic performance. While she was capable of managing both responsibilities, the strain of working while studying could potentially impact her academic progress. Nosi showed her determination to overcome financial struggles, describing how she dealt with her outstanding university fees:

I owe this institution a lot of money—R43 000 (US\$) in arrears. However, I can work to clear that balance. I hustle, you know, I sell pancakes! (Nosi, F, 23).

Nosi's resourcefulness demonstrated through selling pancakes to pay off her university fees exemplifies the lengths students go to meet their financial obligations. Even those who were receiving financial aid such as Nokubonga continued to struggle with financial instability. She explained:

With me, it's different. Yes, I have NSFAS, but it's not enough. I support my family with NSFAS allowances while also taking care of my own needs here at the university. It's hard. I really need to make extra cash. I do casual jobs at a garage in town. (Nokubonga, F, 22).

Nokubonga's experience underscores that even financial aid schemes such as NSFAS are insufficient for most students. She relied on additional casual work to support herself and her family, illustrating students' ongoing financial strain despite receiving some aid. These findings confirm that financial challenges persist for many students, even those receiving support, and they must often find alternative ways to meet their needs. This resilience is a defining characteristic of the students' experiences. However, it is important to note that these strategies—whether working part-time, squatting, or finding creative ways to cover costs—can lead to missed lectures and hinder academic performance, as students like Cici pointed out. Balancing work and study can create significant challenges that can militate against students' academic success.

Discussion

The findings indicated that South Africa's socio-economic landscape profoundly influences the educational experiences of university students, particularly those hailing from Black African communities. According to the 2022 census, Black Africans constituted approximately 81.4% of the national population, yet historical and systemic inequalities have led to significant disparities in wealth distribution, with White South Africans earning nearly three times the average wage of Black South Africans. These economic disparities are mirrored in higher education enrolment statistics, where Black African youth remain underrepresented compared to their White counterparts despite some progress in access (Matyana, 2023). For example, at the University of the Witwatersrand, African student enrolment increased from 56.44% in 2017 to 64.40% in 2022, and the University of Pretoria saw African student representation grow from 52% in 2020 to 57.4% in 2022. However, financial constraints remain a significant barrier to access and retention, as approximately 66% of Black African youth live in poverty, compared to only 4% of White youth (Chiramba & Ndofirepi, 2023).

Research has shown that economic hardship often translates to higher attrition rates, as students struggle to afford tuition, accommodation, and essential study materials, thereby compromising their academic success (Kalalahti et al., 2025). The National Student Financial Aid Scheme (NSFAS) plays a crucial role in supporting low-income students, with 542,653 university students funded in the 2025 academic year, surpassing its initial target of 417,938 beneficiaries were Black and African students. However, concerns remain about the sustainability of such funding, as budget constraints have led to projections that over 87,000 university students could be left unfunded in 2024. These financial uncertainties disproportionately affect Black African students, many of whom rely heavily on NSFAS and other financial aid schemes. The material deprivation university students experience contributes to the high dropout rates observed among economically disadvantaged students, reinforcing the systemic inequalities that persist within South Africa's higher education sector. This study's findings reflect how financial challenges remain one of the most significant barriers to student success and retention, particularly for Black African students, underscoring the urgent need for policy interventions to ensure equitable access and participation in higher education.

The study's findings on Black African students' financial challenges at South African universities provide significant insights into how financial constraints lead to student attrition, which can be understood through Maslow's Hierarchy of Needs. This framework helps explain how the lack of financial resources, which impacts basic needs such as security and physiological wellbeing, undermines students' ability to succeed academically and socially at university. Maslow's theory suggests that individuals must satisfy lower-order needs, such as physiological and safety, before focusing on higher-order needs, such as esteem and self-actualisation. The findings of this study reflect how financial barriers, especially during the registration period, create significant obstacles to fulfilling these foundational needs. Participants shared experiences where financial constraints hindered their ability to register for classes, directly impacting their academic journey. This challenge corresponds to Maslow's foundational needs, specifically the physiological need for food, accommodation, and safety, as students could not access basic university services that would enable them to pursue their studies. According to Chiramba and Ndofirepi (2023), this inability to pay tuition fees is a primary factor preventing students from pursuing higher education, which aligns with Maslow's premise that unmet basic needs lead to an inability to pursue self-actualisation or attain academic success.

The study also highlights students' experiences struggling to meet their basic living expenses, including food, transport, and academic materials. This aligns with Maslow's second level of needs, safety, where students' financial challenges affect their sense of security. Some participants could not afford textbooks or transport, and they were caught in a cycle of stress and insecurity. The lack of access to these basic resources compromises students' academic performance and psychological wellbeing (Naik & Wawrzynski, 2018; Pretorius & Blaauw, 2020). These barriers underscore the importance of financial aid systems in ensuring that students can meet their basic needs. As Maslow's theory suggests, when these needs are not met, students' academic performance and emotional stability are compromised, limiting their potential for growth and achievement.

Another critical finding is the concept of the "missing middle," where students who are financially excluded despite having middle-income status fall outside the scope of government financial aid support. This exclusion reflects Maslow's higher-order needs, such as belonging and esteem. Students in this group face financial challenges despite that

their parents were employed. This reflects how inadequate financial support impedes their ability to meet both basic and higher-level needs. Their struggles also mirror Maslow's concept of self-esteem, as they may feel alienated and undervalued when excluded from financial aid despite being academically capable. The lack of access to NSFAS funding illustrates how these students' financial difficulties undermine their sense of self-worth and belonging in the university setting (Chiramba & Ndofirepi, 2023; de Wet, 2022).

Despite these hardships, the students displayed resilience and resourcefulness, using strategies such as part-time jobs and informal income generation to continue their studies. This resilience constitutes an effort to fulfil Maslow's esteem needs. For example, some students sought ways to mitigate their financial difficulties by working part-time or selling food items such as pancakes to supplement their fees. While this demonstrates remarkable perseverance, it highlights the tension between survival and success. Maslow's theory suggests that while students can be determined to overcome these challenges, the constant struggle to meet basic needs hinders their ability to focus on higher levels of self-actualisation such as academic and personal growth. Their resourcefulness is admirable, however, it reflects the deeper issue of institutional failure to address the full spectrum of students' needs.

Conclusion

This study underscores the significant influence of financial restraints on Black African students in South African universities, demonstrating how these socio-economic obstacles hinder their academic success and overall objectives for personal growth. Maslow's Hierarchy of Needs provided an important lens and framework for comprehending the repercussions of unfulfilled demands on students' academic success. The findings revealed how financial challenges undermine fundamental necessities such as food, housing, and security while obstructing access to educational resources and relevant support systems. These obstacles hinder students from achieving basic needs, such as esteem and self-actualisation, exacerbating dropout rates and constraining their potential. The tenacity exhibited by Black African students amid these problems is remarkable, yet it highlights the insufficiency of institutional frameworks in providing appropriate support. The strategies students adopt to achieve financial stability

frequently compromise their academic concentration and emotional health, culminating in an ongoing conflict between survival and academic success.

This study advocates for a multifaceted strategy to mitigate difficulties, ensuring that students' fundamental needs are satisfied, thus enabling them to concentrate on their academic and personal growth. Universities must improve financial assistance mechanisms, specifically rectifying deficiencies in the NSFAS plan, to guarantee financial assistance and broaden coverage to encompass the "Missing Middle." Supplementary support systems such as subsidised meal programmes, affordable on-campus accommodation, and accessible transportation alternatives, can mitigate immediate financial pressures on students. Institutions must prioritise establishing inclusive academic environments by ensuring free access to critical resources, including textbooks, laptops, and internet connectivity. Moreover, universities should enhance student support services, including counselling and mentorship programmes, to cultivate a sense of belonging and bolster students' confidence in navigating the academic environment. Policymakers and universities must collaborate to develop financial models that address the specific requirements of all students, especially those from low- and middle-income households. Ultimately, overcoming these obstacles is not merely an issue of equality but also a strategic investment in fostering a more inclusive and effective higher education system that empowers all students to realise their maximum potential.

References

- Ajibade, B. & Rembe, S. (2018). Socio-Economic Background and Students' Poor Academic Performance in South African Universities. *The Anthropologist*, 33(1-3), 27-37. <https://doi.org/10.31901/24566802.2018/33.1-3.1975>
- Calitz, T. M. L. (2018). Enhancing the Freedom to Flourish in Higher Education. In *Routledge eBooks*. <https://doi.org/10.4324/9781315207070>
- Carpenter, R. & Roos, L. (2020). Can We Afford It? The association between financial aid and time to completion in Accounting Higher Education in South Africa: A literature review. *The Business & Management Review*, 11(01), 222-232. <https://doi.org/10.24052/bmr/v11nu01/art-24>
- Chiramba, O. & Ndofirepi, E. (2023). Access and success in higher education: Disadvantaged students' lived experiences beyond funding hurdles at a

- Metropolitan South African university. *South African Journal of Higher Education*, 37(6). <https://doi.org/10.20853/37-6-6021>
- Cui, X. (2023). Unraveling University Students' Socio-Psychological Needs in Chinese Cultural Context: Grounded in Maslow's Hierarchy of Needs. *The Eastasouth Journal of Learning and Educations*, 1(03), 116–122. <https://doi.org/10.58812/esle.v1i03.172>
- De Wet, C. (2022). Editorial. *Perspectives in Education*, 1–3. <https://doi.org/10.38140/pie.v40i4.7003>
- Deventer, M.V. & Klerk, N.D. (2016). African Generation Y students perceived personal financial management skills. *The International Journal of Business and Management*, 8, 1-14.
- Dominguez-Whitehead, Y. (2017). Food and housing challenges: (Re)framing exclusion in higher education. *Journal of Education*, (68), 149-169.1
- Fabella, F. E. T. (2023). Investigating the Applicability of Maslow's Theory of Hierarchy of Needs on Selected Filipino Teachers. *International Journal of Research and Innovation in Social Science*, VII(IX), 1892–1916. <https://doi.org/10.47772/ijriss.2023.71053>
- Matsolo, M. J., Ningpuanyeh, W. C. & Susuman, A. S. (2016). Factors Affecting the Enrolment Rate of Students in Higher Education Institutions in the Gauteng Province, South Africa. *Journal of Asian and African Studies*, 53(1), 64–80. <https://doi.org/10.1177/0021909616657369>
- Matyana, M. (2023). Evaluation of the National Student Funding Aid Scheme (NSFAS) Policy in South African Universities: Implications and Challenges. *JISR Management and Social Sciences & Economics*, 21(4), 1–16. <https://doi.org/10.31384/jisrmsse/2023.21.4.1>
- McKay, T., Naidoo, A., & Simpson, Z. (2018). Exploring the Challenges of First-Year Student Funding: An Intra-Institutional Case Study. *Journal of Student Affairs in Africa*, 6(1), 19-32. <https://doi.org/10.24085/jsaa.v6i1.3063>
- Mngomezulu, S.D., Dhunpath, R. & Munro, N. (2017). Does financial assistance undermine academic success? Experiences of 'at risk' students in a South African university. *Journal of Education*, 131-148.

- Muhibbin, M. & Marfuatun, M. (2020). Urgensi Teori Hierarki Kebutuhan Maslow dalam Meminimalisir Prokrastinasi Akademik Di Kalangan Mahasiswa. *Education, 15*(2), 69–80. <https://doi.org/10.29408/edc.v15i2.2714>
- Mustofa, A. Z. (2022). Hierarchy of Human Needs: A Humanistic Psychology Approach of Abraham Maslow. *Kawanua International Journal of Multicultural Studies, 3*(2), 30–35. <https://doi.org/10.30984/kijms.v3i2.282>
- Naik, S. & Wawrzynski, M. R. (2018). Gender, Race, Finance, and Student Engagement in Cocurricular Activities in a South African University. *Journal of College Student Development, 59*(5), 598–613. <https://doi.org/10.1353/csd.2018.0055>
- Omodan, B. I. (2022). Analysis of “Hierarchy of Needs” as a Strategy to Enhance Academics Retention in South African Universities. *Academic Journal of Interdisciplinary Studies, 11*(3), 366. <https://doi.org/10.36941/ajis-2022-0089>
- Phadi, M. (2021). The multiple consciousness of blackness: race and class in South Africa. *Transformation: Critical Perspectives on Southern Africa, 105*(1), 52-73.
- Pillay, N., Bhorat, H. & Asmal, Z. (2021). Higher Education Outcomes in South Africa: The Role of the National Student Financial Aid Scheme. In *Diversity and Inclusion Research* (pp. 171–194). https://doi.org/10.1007/978-3-030-65417-7_10
- Pretorius, M. & Blaauw, D. (2020). Financial Challenges and the Subjective Well-being of First-year Students at a Comprehensive South African University. *Journal of Student Affairs in Africa, 8*(1), 47-63. <https://doi.org/10.24085/jsaa.v8i1.4181>
- Rojas, M., Méndez, A. & Watkins-Fassler, K. (2023). The hierarchy of needs empirical examination of Maslow’s theory and lessons for development. *World Development, 165*, 106185. <https://doi.org/10.1016/j.worlddev.2023.106185>
- Ruswa, A. S. & Gore, O. T. (2021). Rethinking student poverty: perspectives from a higher education institution in South Africa. *Higher Education Research & Development, 41*(7), 2353–2366. <https://doi.org/10.1080/07294360.2021.2014409>
- Ruswa, A., & Gore, O. (2022). Student poverty in South African universities: Promoting the wellbeing and success of students. *Perspectives in Education, 4*–18. <https://doi.org/10.38140/pie.v40i4.6379>
- Sader, S. & Gabela, N. (2017). Specialities of widening participation: Narrative of first-year students receiving financial aid. *South African Journal of Higher Education, 31*(1), 1-16. <https://doi.org/10.20853/31-1-1056>

Sing, N. (2016). International students in the South African higher education system: A review of pressing challenges. *South African Journal of Higher Education*, 29(4), 1-19. <https://doi.org/10.20853/29-4-506>

Wei, Z. & Ma, Y. (2022). The Limitation and Optimization of Maslow's Hierarchy of Needs Theory in Enterprises' Application. *BCP Business & Management*, 17, 161-168. <https://doi.org/10.54691/bcpbm.v17i.388>

***The Trials and Tribulations of University of Johannesburg
Students: Transport as Social Justice for Students***

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Abstract: Scholarship at universities in South Africa tends to focus on access to higher education, fees, decolonisation, and curricula. All these topics are essential and contribute to the literature on South African universities, particularly in post-Apartheid, where the imbalances created by Apartheid had to be explicitly addressed by the post-Apartheid governments within university education, where black people had minimal access to universities. However, this contribution critically discusses an issue that does not appear significant at face value. The article addresses access to safe and affordable transport for students, especially young women, or what is also referred to in this paper as female students residing in working-class areas in Johannesburg. The paper uses in-depth interviews with students to demonstrate that access to safe and reliable transport continues to elude students and young women in university education. Sexual harassment and violence are stories told by interviewees longing for safe and affordable transport as they commute to and from campuses in Johannesburg.

Keywords: Public transport, teaching and learning, students, university

Introduction

The Apartheid regime used transport to enforce racial segregation in the sense that whites had access to public transport that the Apartheid State subsidized and was in the form of trams and buses. On the other hand, Apartheid forced blacks to use overcrowded and expensive transport, and what made it worse was that Blacks needed transport desperately because the Apartheid regime forced them to live in places that were far away from workplaces. The tram system was displaced in the 1960s and replaced by buses, ensuring whites could access a reliable and cheap public bus system (Khosa, 1998; Pirie, 2003).

Between 1955 and 1957, from Alexandra township near the affluent suburb of Sandton in Johannesburg, black residents organised a bus strike called “Azikwela” which means “We will not ride” in English. Nelson Mandela was among those who supported the bus boycott in Alexandra. One of the outcomes of the strike was a slight improvement in the bus system in the township. The boycott forced the Public Utility Transport Corporation (PUTCO) to reduce bus fares in Alexandra (Bonner & Nieftagodien, 2008).

Minibus taxis, or what the article refers to as taxis, were introduced in the 1970s as a response to very poor transport access for blacks who were displaced by the Apartheid regime to faraway places with limited economic opportunities and jobs (Govender 2016). Taxis are a privately owned transport system used by the South African public, mainly from the townships in Johannesburg. This mode of transport is unsafe, violent, expensive, generally unreliable, and overcrowded (Schaefer, 2024).

The democratic government of South Africa was supposed to deliver safe, reliable, and affordable public transport. However, moves towards privatization and austerity measures were introduced by the ANC-led government in the 1990s. It became clear that safe and cheap public transport was not on the horizon. There has been a decline in what a minimal Metro train system and the Bus Rapid Transit System, which the city of Johannesburg introduced in the 2000s to cover minimal areas in Johannesburg, and the Gautrain, a train system moving generally middle-class people from Johannesburg to Pretoria and the OR Tambo International Airport is expensive and inaccessible to working-class commuters (Risimati, et al. 2020; Domingo, 2023).

In 1994, universities and technikons (now called universities of technologies) enrolled 495,000 students (Department of Monitoring and Evaluation, 2014); this number increased by just above 1 million in 2024 (Parliamentary Monitoring Group, 2024). The 100% increase in the number of students enrolled in public universities had to do with the massification and increased access for black communities and black women in particular. While this was a commendable action by the government in post-Apartheid South Africa, the government never matched access to affordable and safe transport for students from working-class communities and rural communities and women students in particular. Ideally, students should be staying in accommodation near universities; however, South Africa's public universities had a shortage of about half a million beds (Johnson, 2025).

University student transport, particularly those who are young women, is an issue that tends to be ignored by policymakers and academic publications; the focus tends to be on access to university education and fees, and later, it became accommodation (Mzileni & Mkhize, 2019; Langa, 2017; Mhlongo et al., 2021). Therefore, this article fills the gap in the emerging literature on student transport in South Africa (Du Toit, 2013; Mbara et al., 2013; Ofentse & Zuidgeest, 2020). Based on in-depth interviews, the article focuses on young women at the University of Johannesburg. This university generally caters to students from working-class townships and rural areas.

Researching public transport and students

Established in 2005 as part of the amalgamation of some universities in Johannesburg, UJ has seven faculties and a College of Business and Economics. The university prides itself on having more than 50,000 students, of which 300 are international students from 80 countries. UJ is one of the largest contact universities in South Africa, making transportation critical to its operations (UJ, 2021). I am a social justice researcher employed at the university, and my job is to use scholarship to point out the fault lines as far as social and economic justice issues are concerned. In pursuit of social justice, some scholars, particularly those engaged in the field of social justice, must go against the grain in their scholarship so that the voices of students coming from working-class communities are included in the discourses surrounding social justice and education.

Ten UJ students – seven females and three males – between the ages of 20 and 25, took part in this research. The participants were from various areas, including Soweto, Orange Farm, Alberton, Tembisa, Roodepoort, and Diepsloot. They were interviewed in 2020 during the COVID-19 pandemic and lockdown period. All of the participants come from working-class areas within the Gauteng province, which is the biggest economic hub in South Africa, and frequently experience transport challenges. It must be noted that not all students at UJ use taxis; there are those who come from affluent families and are generally doing full-time studies and based on the main campus called Auckland Park Kingsway (APK campus), which is the largest campus (Mbara & Celliers, 2013).

Ethical clearance to conduct the research was obtained from UJ in 2019. Participation was voluntary and written informed consent was obtained before conducting the interviews. Their rights were also read to them beforehand. Furthermore, to ensure the safety and protection of the participants, pseudonyms were used instead of their real names to maintain anonymity. The interviews primarily focused on the journey from the working-class areas to the university, addressing various topics related to this aspect of transportation. For example, the researcher wanted to know: At what time did the preparations for the journey start? What were the experiences and encounters from the students' places of residence to the taxi, inside the taxi, and up to the completion of the journey? For instance, how did transportation impact class attendance? What did you encounter as you were traveling to and from campus? How did transport injustice affect you as a student and as a young woman? The participants' responses were transcribed verbatim, and direct quotes are used to support the study's findings below.

Time management and public transport

The migrant labour system and various laws and practices that led to the removal of black people from places that were for economic activities, such as cities and towns, placed a heavy transportation burden on black workers and black communities. For example, travelling from the outskirts to the city centre is costly from both a financial and time perspective. The scarcity of the morning trains moving from the township to Johannesburg led to overcrowding in the trains and many workers arriving late for work in the inner city and the industrial areas (Pirie 1986). Coming late to class at universities can have devastating consequences. A student may miss a lecture, resulting in poor

performance on tests or examinations. Additionally, their tardiness can disrupt the flow of the class, impacting both the lecturer and fellow students. Ultimately, being consistently late to class has a negative impact on both the academic experience of the student and the overall classroom environment. At Notre Dame University-Louaize (NDU), a private university in Lebanon, late arrival incurs a penalty unless the student has a valid excuse. Furthermore, any instance of lateness is treated as an absence, even if it is caused by delays in traffic, which is beyond the control of the students (Malek, 2014).

In the current study, Xu, a female student living in Soweto near Johannesburg, stated that she has to wake up very early to avoid being late for class that starts at 08h00 or 09h00. In this regard, she stated the following:

'... I need to be early to get to campus in order to avoid traffic. So, I wake up at 05h00, and I need to be out of the house at 06h30' (Xu, female student, Soweto).

Likewise, Phira, a male student residing in Diepsloot in the west of Johannesburg, echoes the same sentiment:

'... I am in taxi by 16h00 because around 17h00 I know many people are at the taxi rank and there will be long queues ... I think I get to Diepsloot around 19h00...' (Phira, male student, Diepsloot).

Similarly, Ku, who resides in Orange Farm, a township located in the south of Johannesburg, emphasised the necessity of waking up early in the morning to make sure that she is on time for morning classes. Ku elaborated on this point,

'I usually wake up at, like, 05h30. If I'm late, it's like 06h00, and I need, like, an hour and half to get ready, and then maybe before 08h00 or 07h30, I will be out of the house, and then I will get to campus at, like, 09h00. So, I try to leave campus before 17h00 in winter; I have to make sure I leave campus early so that I don't get home when it's too dark; but in summer I can leave campus at, like, 17h30 ...' (Ku, female student, Orange Farm).

Students such as Ku are also not able to leave campus late because they do not want to get to their homes when it is dark for safety reasons. Unlike in Europe and other countries of the Global North, students in South Africa are extremely constrained by the lack of public transport in the evenings. That imposes a curfew of a special type, as they

are unable to stay on campus and use study facilities like libraries until very late at night, as their counterparts in Europe and the West are able to do. This finding aligns with a study that investigated student transport in both Berlin and Johannesburg, revealing that students in Johannesburg perceived the city's public transport system as imposing a curfew on them, restricting their mobility in the evenings (Monakali, 2015).

Mode of transport used, challenges, and the impact on students

Taxis typically do not leave their stations until they are full to capacity, leading to delays for university students who rely on this mode of transport. In many cases, they end up missing not just classes but also examinations and tests, even though they have made adequate preparation on their side to avoid arriving late. Avru, who is a female student residing in the west of Johannesburg, elaborates on this point:

'I had an oral exam the other day, so I woke up and I got dressed, and the taxi came early which was fine, and I got to the rank a bit early. Then I had to wait inside the taxi for about an hour before it filled up, and, [in my] mind, I am like "it's not gonna move until it's full." So I realised that, okay, my oral exam will start in about 30 minutes and there were only two of us in the taxi ... it took me to be in that scenario for me to make up another plan so I had to call up – call people – to sort of get transport' (Avru, female student, Roodepoort).

Mpume, a female student who lives in Alberton in the south of Johannesburg, complained about the buses that take longer to travel from Alberton to Johannesburg. She lamented the following:

'... Buses take longer – the trips are longer – and takes little more time because you are in the bus for more like an hour or hour and half. Due to traffic as well, sometimes, but if there is no traffic you can take about an hour, and you need to have time, prepare yourself for class, and if you [are] not in time, you will not have time to look at your books, even though you have studied, but you need more time to prepare yourself ... if you are late, it kind of impact[s] on your energy level, definitely ...' (Mpume, female student, Alberton).

The psychological effects of these delays on the buses are expressed by Mpume when she points out that the delays negatively impact her ability to prepare for classes.

As such, the energy levels become low, and that definitely impacts concentration levels and focus on what is being taught in class. Riding a bus generally leads to anxiety, even in the developed world, because students may fear that the bus might be late or full. However, in the South African context, where there are no viable alternative modes of transport, a bus ride exacerbates anxiety (Gill, 2021).

The national transport survey conducted by Statistics South Africa (StatsSA) in 2020 confirms the above-mentioned findings. According to the survey, transport conditions deteriorated between 2013 and 2020. For example, travel time for all modes of transport escalated. However, students using private transport when travelling to universities were not affected by this change. Using private transport, it probably takes about 45 minutes to travel from Orange Farm to the University of Johannesburg. Students using different public transport experienced long travel times in the morning, ranging from 59 minutes to 91 minutes.

StatsSA (2020) further reported that in some cases, students spent almost 66% of their income on public transport in 2020. High transport costs and long distances travelled by students to and from universities negatively affect the participation of students, as they are compelled to use their limited financial resources, originally intended for food and other academic-related items, for transport (cited in Ofentse & Zuidgeest, 2020).

This research also shows that public transport costs to and from UJ are astronomically high. Bhu, a student from Tembisa in Kempton Park (near Johannesburg) who uses taxis, states that, *'Okay, I get allowance from NSFAS [National Student Financial Aid Scheme]. It is R1 500; it was R1 400 [in] 2019 and it increased to R1 500 per month in 2020 and 2021 ... I spend around R1 000 [per month using taxis]'* (Bhu, male student, Tembisa). This shows that two thirds of Bhu's income is spent on public transport, making it the student's largest expense overall.

However, Tso, a female who resides in Soweto, received supplementary income from her mother, resulting in her total income being double to that of Bhu. She said:

'... The one [source of funds], it's obviously from [a] bursary, NSFAS, and the other one, it's from my mother really, that's the source of income, I get allowance ... Combined, it would be like R3 000 ... to travel from home to school [University of Johannesburg]. I will literally maybe put R 1 000 aside to use it for transport' (Tso, female student, Soweto).

One of the findings of research commissioned by the Gauteng government (2020: ii) was that in 2020 about 6 out of 10 households in Johannesburg spent more than 10% of their “household income on public transport”. This was an extremely credible survey because the sample had a population close to 7,000. It appears as if transport costs are becoming an issue in the Gauteng Province. The Gauteng City-Region Observatory, a research organisation supporting the Gauteng government with research, also confirmed that transport costs were in many ways undermining the freedom of movement for residents of Gauteng. In fact, the costs for transport between 2011 and 2023 increased by 17% in some instances.

At the heart of the problem is that transport is privatized and public transport in the form of buses and trains has been eroded. South Africans finding it more expensive to get around town. The survey’s population was about 14,000 residents of the province. One of the striking conclusions of the survey is that 16 million residents are spending more money on transport than they did in 2017 (Thorne, 2024).

Other data confirms what is being stated by surveys and individual testimonies. Despite being an economic hub of South Africa, Johannesburg’s transport is expensive, unreliable, violent and chaotic. Disorder is the norm, and this applies to the metro rail system, buses, and taxis. The bus rapid transit system called Re Vaya (we are going) which was launched 16 years ago seems to be going nowhere. According to Mashale, the City of Johannesburg Municipality did not receive a government transport grant worth R313m because the bus system had problems, such as poor management of revenue, low passenger numbers, reduction of the number of operational buses and generalised chaos. The Development Bank of Southern Africa (DBSA, 2022) revealed that “South Africa has an urban access gap of 92%, based on the length of the rapid transit lines per million people”. The DBSA also state that most South Africa rely on informal or private taxis as their mode of transport.

Violent encounters

A study published in 2013, involving a sample size of 508 taxi drivers in Mumbai, shed light on the prevalence of stress and anxiety among taxi drivers. The study found that various factors such as pressure to meet financial targets, traffic congestion, and

interaction with passengers and other road users contributed to the heightened stress levels experienced by the majority of taxi drivers.

According to Eagle and Kwele (2021), UJ students using taxis spoke about accident risks, reckless driving, bullying and abuse between drivers and passengers, crime, sexual harassment, and basic violations of the rights of women. All these deviant acts caused anxiety, stress, and fear among the interviewees. One of the major concerns regarding the taxi industry is the persistently poor working conditions. Taxi drivers frequently vent their anger due to the long working hours and the generalised precariousness of their work (Fobosi, 2021). Students in Johannesburg also face challenges similar to those faced by passengers in Mumbai.

However, the case below indicates that violence in taxis can be extreme, to the extent that young black women who are students are often exposed to gun violence. Bi, who resides in Soweto, has this to say about gun violence:

'... It was on a Saturday, and you know on Saturdays we often write [exams] around 12h00 ... So, I got into a taxi at round 08h00, and the taxi only left around 09h30 or just before 10h00, because it's already after 07h00 so taxis take time to get full. So, this lady paid [taxi fare] with R100. When the taxi got to Mzimhlophe [an area in Soweto], she then asked for her change because we all have paid. So, he [taxi driver] said, "I will give you your change," so this lady kept on going and she's talking to a male taxi driver, and I think they were more or less about the same age. He got angry and actually pulled out a gun and asked, "Do you still want your change?" and she said "no" and that was the end of it. So, she is harassed and she didn't get her change ...' (Bi, male student, Soweto).

In the above incident, the female victim experienced trauma, abuse, and bullying at the hands of a male taxi driver. In addition, the student who was about to write an examination at the university also suffered from fear, anxiety, and stress due to the driver's actions. The incident in the taxi reflects the issue of gender-based violence that women face on a daily basis in South Africa (Eagle and Kwele, 2021).

The cost of living in cities, such as Johannesburg, is extremely high. Transport, food, electricity are expensive in South Africa, and they tend to increase and surplus inflation. Fuel prices are exorbitant and have a negative impact on the affordability of transport. The fact that South Africa does not have what can be regarded as reliable subsidies transport make life extremely difficult, especially those low-income households

(Pietermaritzburg Economic Justice and Dignity Group, 2025). Despite being the dominant mode of transport, taxis are expensive because they are not regulated properly. What makes them to be expensive is that many South Africa are unemployed and those who are working earn low wages. According to Ngubane (2017:1), “The driving behavior of most taxi drivers is usually reckless as they have a habit of breaking most of the rules of the road and taxi fares are not stagnant, but alternate due to peak time and weather. In this industry, there are no strict laws or rules to guide their activity, and as there are issues with government officials owning taxis, regulation is not prioritized”. Taxi drivers, as argued by Fobosi (2019) are precarious workers who work long hours, and their employment is not formalised.

Tribalism tends to affect relations between passengers, drivers, and taxi driver workers. There exists a perception that Zulu-speaking taxi drivers and taxi rank workers, who dominate the industry in Gauteng, tend to be rude (Ntuli, 2017). Although this issue is beyond the scope of the paper, it is acknowledged as a complex historical matter. However, the research unearthed tribalism and often adversarial relationships in taxis as a mode of transport.

Expanding on this matter, Phu remarked,

‘... This other time, I was at Bree taxi rank [in Johannesburg]. So, I asked this guy where can I get the taxi to Auckland Park; that was my first time so, the guy, he is Zulu [-speaking] and said, “if you want me to help you, you better use Zulu, not English, because here you [are] not at school, you [are] at the taxi rank, use your English where you learnt it. Here we don’t use English ...”’ (Phu, male student, Diepsloot).

The safety of students in general is an issue that affects them throughout their academic lives. Even after being dropped off by a taxi and on their way to a taxi station, they are continuously surrounded by fear and anxiety. There are many painful and distressing stories of students being preyed on by criminal elements in the Braamfontein, Auckland Park, and Doornfontein areas where students have a very strong presence. It has to be noted that UJ has attempted to provide security in places that are near campuses. Despite all these efforts, students are robbed of valuable academic items such as their laptops and smartphones. Phe, who is also a student living in the Bosmont area in the west of Johannesburg, elaborates on this point:

'Even just walking in general in Johannesburg, in that whole Bree [a street in Johannesburg], Bram [Braamfontein in Johannesburg] area, like generally I don't feel safe, but that just makes me more vigilant if anything ... I have heard [a] lot of stories about people getting mugged, and I also got mugged back in PE [Port Elizabeth] ... So, I always say a prayer as I walk ... as soon as I get close to an area where I can see there are those security cars from UJ; if I see one [car], then I will ask them to escort me as I walk to gate 2 ...' (Phe, female student, Bosmont).

Phu had an unpleasant encounter in a taxi, which he recounts as follows:

'Remember this other time, my friend was coming from Pretoria. So, in that taxi, there were two guys in a taxi; when they get to the forest, they stopped the car and said: "Everybody out, we want everything that you have". They took out the guns ...' (Phu, male student, Diepsloot).

The impact of public transport on students

Using public transport is generally stressful for students, and this is exacerbated by the fact that South Africa has a chronic transport crisis. Time is an important resource for students. Spending a lot of time traveling does not only cause stress and anxiety among students but also affects them negatively in other ways. One of the reasons for the poor performance of students is the logistics of transport to and from universities (Schoeman, Van Zyl and Smego, 2015).

With regard to transport-related stress, Ku commented:

'So, I would have to wake up extra early as an undergraduate student, especially in [the] first year. I was always tired. Sometimes I would get home and just drop my bag on the bed and sleep because I am so tired. I would have spent four hours of my day ... commuting and being abused by so many people on the way. So, it's exhausting in undergraduate because we [are] adjusting to school and we [are] also adjusting to transport, and there are other factors that are in the way; so, the productivity is low. Like, for you to get distinctions, you literally have to fight, like physically and emotionally, because of the transport. It adds to the weight that you have to carry as a student' (Ku, female student, Orange Farm).

Ku spent four hours travelling to and from the university, and the journey is often accompanied by abuse and various forms of violence. As shown by the testimony of the interviewee, the productivity of students is undermined by the time delays and encounters on public transport. The emotional and physical burden carried by students is heavy, and it seems as if policymakers and university management have not responded adequately to ease the burden on students.

The stress and anxiety caused by public transport caused Kwa, another student, to conclude:

'Personally, I don't recommend public transport to students. I feel like students should actually use private transport because, you know, there's a lot happening in the taxi industry right – in public transport. Some of the things are very traumatic, you know. Students get robbed, you know; some, they lose their lives ...' (Kwa, male student, Tembisa).

Trains are not an option

Students were asked why they were not using trains to travel to and from campus. It became clear from their answers that the train was not an option because of overcrowding and security concerns. In this regard, Xu elaborated as follows:

'Ah, trains, no. Trains, no! It's a definite no because trains are not safe. Trains are very, very bad. My grandmother used trains back in Katlehong. She got mugged, I don't know how many times. She got pushed, she once fell and broke her leg, you know? It's like all the people trying to be inside the train. It gets very packed, it's stuffy. You get robbed because now it's packed, there's like a lot of people. You also, like, considering COVID, and I don't think [the] train is the safest place to be' (Xu, male student, Soweto).

However, the situation described above has worsened because many Metrorail lines from the working-class areas outside the city centre of Johannesburg are dysfunctional due to cable and rail theft and vandalism. This has aggravated the chronic road traffic situation, causing an extreme increase in traffic volumes as people move away from rail transport to road transport. According to Williams (2021), the problem dates back to the 1980s when the apartheid regime began privatising the railway system and moving the railway police to the South African Police (SAP). To demonstrate the gravity

of the transport situation, in 2019, the British Broadcasting Corporation (BBC) reported that Ramaphosa was stuck in a train for four hours on a journey that was supposed to take 45 minutes (BBC, 2019). Furthermore, overcrowding in the trains makes fighting the COVID-19 pandemic more difficult due to constant overcrowding and the non-existence of physical distancing, as alluded to by Xu at the end of the above excerpt.

It is austerity, privatisation and corruption

Interestingly, Williams (2021) traces part of the transport crisis South Africa is experiencing today back to 1971, when the rail policy was changed to promote the transportation of goods on the road. Following the intervention of private consultants, the South African Railways and Harbours (SARH) was renamed the South African Transport Services (SATS) in 1981. The consultants introduced a neoliberal ideology into the transport system by creating business units that were to make a profit, not to serve the public good. Williams (2021) also highlights the continuity in the privatisation and underinvestment in rail transport from the days of the then State President P.W. Botha and former State President Thabo Mbeki, who served the second democratically elected government. Williams' (2021, 1) comments:

In April 1990, after 80 years of direct government and parliamentary control of the railways, Sats became a limited liability company under the name of Transnet Limited. The National Party administrations of PW Botha and FW de Klerk were in favour of privatisation of major state-owned entities, an approach that was broadly adopted by the first ANC administration under Nelson Mandela. But the push for privatisation in the 1990s was later abandoned by the ANC under President Thabo Mbeki.

The problem is compounded by Metrorail's near collapse due to poor governance, lack of investment, and corruption. Indeed, theft and vandalism are the reasons for the Metrorail trains in Gauteng and the Western Cape not functioning properly. For example, Transport Minister Fikile Mbalula told parliament that 142 train stations in Gauteng did not have electricity – something that is crucial for the functioning of the electric train (Nkosi, 2020). This means that the students are not able to use this mode of transport, as shown by this study. On the other hand, the Rea Vaya bus system, which was established

in Johannesburg and other areas in 2009, is currently facing a crisis primarily due to its limited coverage. Ubisi (2016, iv) also stated other problems: 'Yet, seven years later, the Rea Vaya BRT [Bus Rapid Transit] system has not managed to provide a reliable and accessible alternative mode of public transport. The level of service – particularly the electronic system – appears to be failing many of the respondents, and the low area coverage was seen as a major setback.' Despite attempts to reduce prices for students, not even a single student interviewed uses the Gautrain, a mini-speed train moving middle-class people in some parts of Gauteng (Molosankwe, 2021).

Having discussed the sources of the public transport crisis, the students were asked to come up with proposals to address their transport concerns.

Some proposals and recommendations

Kwa's recommendation that students must refrain from using trains to travel to UJ is disheartening and shows that public transport is in a state of disaster. For example, many Metrorail lines in Gauteng and the Western Cape have been dysfunctional for many years. That is why passengers who would have used Metrorail services are using taxis and buses as an alternative mode of transport. Even when it was still operational, students would avoid using the Metrorail service due to the long delays of up to four hours at a time (Hlatshwayo, 2019). As stated earlier, public transport was part of the first and second industrial revolutions. The first electric train was invented in 1924 in South Africa; Johannesburg had a bus network in the 1940s. Today, in 2023, the state is unable to deliver a safe and reliable transport system to cater to students from working-class families and their working-class parents. Chronic austerity measures and corruption have disabled the state from addressing public transport problems and other social and economic challenges (Munzhedzi, 2016). Du Toit (2013) advised that solutions to transport problems can only come from those using different modes of transport, as they know exactly what is wrong and what is right. Following Du Toit's (2013) counsel, students were asked to make recommendations and proposals to improve their transport.

Kwa spoke about the need to train taxi drivers so that they have better relations with passengers and other road users. In this regard, Kwa commented,

'So, I feel like you should be training – training to be a better driver. There should be education. They should try to teach taxi drivers how to be good drivers. Actually, there should be awareness. They should spread awareness in terms of roads, in terms of how you should treat passengers, how you should drive, and everything' (Kwa, Tembisa).

Bi was extremely concerned about gender issues and general harassment at the taxi ranks and inside taxis. In this regard, Bi articulated the following:

'So, I feel that even before we can try and implement technology within the taxi industry, we need to start addressing gender equality. There's so many issues that we need to deal with before we actually talk about technology in the taxi industry'. (Bi, Soweto)

Ku suggested that the solution is to ensure that students are accommodated near the university so that they do not have to travel long hours to and from universities. In the meantime, Bhu suggested that UJ, the state, the Department of Higher Education and Training (DHET), and the Department of Transport should provide transport services for students living in the townships.

UJ currently provides accommodation to only a very small percentage of its student population on campuses. However, it has been suggested that by accommodating around 80% of the student population, the transport problems faced by the students will be alleviated (Mbara and Celliers, 2013). This view is supported by the White Paper for Post-School Education (DHET, 2013), which already highlighted student accommodation as a pressing issue in 2013. The White Paper argued, "There is a grave shortage of student accommodation in universities, as well as poor living conditions in many of the existing residences. Very low numbers of first-year contact students are accommodated in university residences, which is likely a contributing factor to poor performance in the first year of study' (DHET 2013, 33). Despite making some progress in providing accommodation to certain students, the challenge persists as many continue to reside in townships located far from the university (UJ, 2020). For this reason, the partnership between the university and the state (DHET and the Department of Transport) through the provision of buses and bigger taxis to ferry students between their homes and the university may help ameliorate the transport crisis facing the students. This will provide a safer and more reliable alternative, ensuring that students are no longer reliant on

violent and unreliable modes of transportation to get to their classes. New applications in managing transport demand and supply for student transport to and from UJ campuses may assist in providing transport services to students in the envisioned state and university-run public transportation system in the future. The proposed vehicles could utilise the existing Rea Vaya bus routes to transport the students in the future.

Elected representatives of students at the university should hold workshops and meetings with the students to ensure that female students and other students can provide a critique of the existing crisis pertaining to transport. Students will also need to be provided with ample space to formulate solutions and proposals to ensure that students can access safe and affordable transport that promotes dignity and respect for women and students in general. Safe buses organized by the university and DHET will have to operate to inculcate accountability to students and the Student Representative Council (SRC), representing students who desperately need safe and affordable transportation.

Conclusion

As shown in this paper, all technological revolutions were not just about inventions that changed production and the relations of production. In essence, technological innovation in the form of these revolutions had corresponding changes in the transport systems. On the other hand, debates on transport tend not to recognise the fact that all technological surges also entail the role of new technologies in 'revolutionising' the transport system. Interventions and management of student transport and mobility have to be a joint partnership between the state and universities. In the long term, the South African state has to deal with the public transport crisis (Luke, 2018). Linked to that, many South Africans own cars because public transport is not reliable. Having many cars on the road is the cause of traffic jams that affect students and those interviewed in this study. The findings of this study and others demonstrate that there should be policy and legislation governing student transport because students have very special and specific transport needs (Mokwena & Zuidgeest, 2020). This research has also shown that students are crying out for help. Safer public transport is needed to improve their academic performance and quality of life. Alongside that, the students are proposing that student accommodation near universities is one of the long-term solutions to the student transport problem in South Africa. Indirectly, the students and

the researcher of this article, are imploring academics, intellectuals, and the state to shift their focus away from esoteric debates that have no relevance to the daily challenges experienced by students. South Africa is a country that urgently needs to reverse its deepening underdevelopment trajectory, and this can only be achieved when almost all energies, resources, and intellect are directed at finding solutions to student transport and other developmental needs.

References

- Appolis, J. (2018, September). *The 4.0 industrial revolution and workers*. Paper presented at the annual Jozi Book Fair, Newtown, Johannesburg.
- Bonner, P., & Nieftagodien, N. (2008). *Alexandra: A history*. Johannesburg: Wits University Press.
- British Broadcasting Corporation (BBC). (2019, March 18). *South Africa's President Ramaphosa gets stuck on train*. <https://www.bbc.com/news/world-africa-47611496>
- Department of Higher Education and Training (DHET). (2013). *White paper for post-school education and training: Building an expanded, effective and integrated post-school education*. Pretoria: DHET.
- Department of Monitoring and Evaluation. (2014). *Twenty year review South Africa 1994 - 2014*. <https://www.dpme.gov.za/publications/20%20Years%20Review/20%20Year%20Review%20Documents/20YR%20Education.pdf>
- Development Bank of Southern Africa (DBSA). (2022, November 15). *Going beyond the infrastructure funding gap: A South African perspective – Transport Sector Report*. <https://www.dbsa.org/sites/default/files/media/documents/2023-08/Beyond%20the%20Gap%20-%20Transport%20Sector%20Report%20-%202022.pdf>
- Domingo, T. (2023). *The role of transit-oriented development in spatial transformation and sustainable mobility: Experience of Jabulani, Soweto* (Master's thesis, University of Johannesburg, South Africa).

- Du Toit, J. L. (2013). Student preference for alternative modes of transport at the University of Pretoria, South Africa. *WIT Transactions on Ecology and the Environment*, 173, 345–353.
- Eagle, K., & Kwele, K. (2021). “You just come to school, if you made it, it's grace”: Young Black women’s experiences of violence in utilizing public ‘minibus taxi’ transport in Johannesburg, South Africa. *Journal of Interpersonal Violence*, 36(15–16).
- Fobosi, S. C. (2019). Employment practices within the minibus taxi industry in Johannesburg: A study of precariousness of jobs in South Africa. *African Sociological Review*, 23(2), 103–123.
- Fobosi, S. (2021). Covid-19 and precarity in South Africa’s minibus taxi industry. *World Journal of Social Science*, 2(3), 1–15. <https://doi.org/10.22158/sshsr.v2n3p1>
- GAUTENG HOUSEHOLD TRAVEL SURVEY. (2019/20). *Regional report for the City of Johannesburg*.
https://www.csir.co.za/sites/default/files/Documents/GHTS_JohannesburgReport_final%20low%20res.pdf
- Gill, M. (2021). *How public transport can trigger anxiety*. <https://www.hypnosis-in-london.com/social-anxiety-public-transport/>
- Govender, K. K. (2016). Exploring public transport service quality: The case of mini-bus taxi service in South Africa. *Eurasian Business Review*, 6, 101–116.
- Hlatshwayo, M. (2019). Debating the fourth industrial revolution: First things first. *New Agenda: South African Journal of Social and Economic Policy*, 2019(75), 26–29.
- Johnson, B. (2025). South Africa’s student accommodation crisis: Urgent need for safety, security and solutions. *Future SA*. <https://www.futureasa.co.za/whats-new/south-africas-student-accommodation-crisis-urgent-need-for-safety-security-and-solutions/>
- Khosa, M. M. (1995). Transport and popular struggles in South Africa. *Antipode*, 27(2), 167–188.
- Langa, M. (2017). Researching the #FeesMustFall movement. In *Hashtag: An analysis of the #FeesMustFall movement at South African universities* (pp. 6–12).
- Luke, R. (2018). Car ownership perceptions and intentions amongst South African students. *Journal of Transport Geography*, 66, 135–143.
- Malek, A. S. (2014). Common issues university students face: Problems and solutions. *International Journal of Liberal Arts and Social Science*, 2(2), 44–46.

- Martin, J. (2024, September 9). Sexual violence in South Africa: Women share their stories about the dangers of commuting on minibus taxis. *The Conversation*. <https://theconversation.com/sexual-violence-in-south-africa-women-share-their-stories-about-the-dangers-of-commuting-on-minibus-taxis-236605>
- Mbara, T. C., & Celliers, C. (2013). Travel patterns and challenges experienced by University of Johannesburg off-campus students. *Journal of Transport and Supply Chain Management*, 7(1), 1–8. <https://doi.org/10.4102/jtscm.v7i1.114>
- Mhlongo, H. R., Nongalo, N., & Linake, M. A. (2021). The dynamics of students' accommodation spaces: Implications for the acquisition of pedagogical content knowledge. *e-BANGI*, 18(4), 174–187.
- Molosankwe, B. (2021, February 24). Gautrain gifts students 25% discount for trips. *IOL*. <https://www.iol.co.za/news/gautrain-gifts-students-25-discount-for-trips-da29d96c-288b-42b9-939b-bc0973ba75b9>
- Monakali, M. (2015). *A comparative study of students' experience of public transport in Johannesburg and Berlin* (Honours report, University of the Witwatersrand).
- Mokwena, O. H., & Zuidgeest, M. (2020). Identifying transport policy gaps in student travel demand management in South Africa. *Journal of Transport and Supply Chain Management*, 14(1), 1–13. <https://doi.org/10.4102/jtscm.v14i0.522>
- Munzhedzi, P. H. (2016). South African public sector procurement and corruption: Inseparable twins? *Journal of Transport and Supply Chain Management*, 10(1), 1–8.
- Mzileni, P., & Mkhize, N. (2019). Decolonisation as a spatial question: The student accommodation crisis and higher education transformation. *South African Review of Sociology*, 50(3–4), 104–115.
- Ngubane, L. (2017). The state of public transport in South Africa. <https://www.saferspaces.org.za/understand/entry/the-state-of-public-transport-in-south-africa>
- Nkosi, B. (2020, September 7). Transport minister Fikile Mbalula revealed in a written parliamentary reply that 142 train stations in Gauteng do not have power. *IOL*. <https://www.iol.co.za/the-star/news/142-train-stations-in-gauteng-have-no-power-leaving-townships-stranded-e1961fe5-7aad-4c77-9fee-93eef9488944>
- Ntuli, V. H. (2017). *The personality profile of Zululand taxi drivers* (Master's dissertation, University of Zululand).

- Ofentse, O. H. M., & Zuidgeest, M. (2020). Identifying transport policy gaps in student travel demand management in South Africa. *Journal of Transport and Supply Chain Management*, 14(1), 1–13. <https://doi.org/10.4102/jtscm.v14i1.522>
- Parliamentary Monitoring Group. (2024, February 28). *2024 registration and enrolment; Certification backlog in the TVET and CET colleges; DHET Q1-3 2023/24 performance; Establishment of new universities; with Deputy Minister Higher Education*. <https://pmg.org.za/committee-meeting/38450/>
- Pietermaritzburg Economic Justice and Dignity Group. (2025, April 30). *Key data from April 2025 household affordability index*. https://pmbejd.org.za/wp-content/uploads/2025/04/PMBEJD_Key-Data_April-2025_30042025.pdf
- Pirie, G. H. (1986). Johannesburg transport 1905–1945: African capitulation and resistance. *Journal of Historical Geography*, 12(1), 41–55.
- Pirie, G. H. (2003). Travelling under apartheid. In *The apartheid city and beyond* (pp. 173–182). Routledge.
- Ramaphosa, C. (2019). *State of the Nation Address 2019*. South African Government. <https://www.gov.za/speeches/2SONA2019>
- Risimati, B., Gumbo, T., & Chakwizira, J. (2020). The state of rail and road route transport networks integratedness in the City of Johannesburg: An expose. <https://repository.corp.at/800/>
- Schaefer, L. E. (2024). *The price of mobility: A criminological exploration of minibus taxis, violence and urban space in South Africa* (Doctoral dissertation, University of Oxford).
- Schoeman, S., Van Zyl, G., & Smego, R. A. (2015). A faculty-led solution to transport-related stress among South African medical students. *African Journal of Health Professions Education*, 7(2), 170–175.
- SowetanLIVE. (2025, April 30). *Joburg loses R313m transport grant over Rea Vaya failures*. <https://www.sowetanlive.co.za/news/2025-04-30-joburg-loses-r313m-transport-grant-over-rea-vaya-failures/>
- Statistics South Africa (StatsSA). (2020). *The National Household Travel Survey in South Africa (NHTS): South Africans take 45 million trips, mostly by foot*.
- Thorne, S. (2024, December 28). South Africans finding it more expensive to get around town. *BusinessTech*. <https://businesstech.co.za/news/motoring/800942/south-africans-finding-it-more-expensive-to-get-around-town/>

- Ubisi, S. (2016). *The social impacts of the Rea Vaya Bus System on the residents of localities affected by the development: The case of Rea Vaya in Moroka, Soweto* (Unpublished research report). University of the Witwatersrand.
- University of Johannesburg (UJ). (2020). *Residence life*. <https://www.uj.ac.za/studyat-UJ/Student-Accommodation-Residence-Life/Pages/-Residence-Life.aspx>
- University of Johannesburg (UJ). (2021). *About University of Johannesburg*. <https://www.uj.ac.za/about>
- Williams, D. (2021, April 20). What broke South Africa's rail and can it be fixed? *Daily Maverick*. <https://www.dailymaverick.co.za/article/2021-04-20-what-broke-south-african-rail-and-can-it-be-fixed/>

List of interviews

- Avru. 2021. UJ student, Roodepoort, 31 May 2021.
- Bhu. 2021. UJ student, Tembisa, 31 May 2021.
- Bi. 2021. UJ student, Soweto, 24 June 2021.
- Ku. 2021. UJ student, Orange Farm, 04 June 2021.
- Kwa. 2021. UJ student, Tembisa, 02 June 2021.
- Mpume. 2021. UJ student, Alberton, 04 June 2021.
- Phe. 2021. UJ student, Bosmont, Johannesburg, 01 June 2021.
- Phira. 2021. UJ student, Diepsloot, 03 Jun 2021.
- Phu. 2021. UJ student, Diepsloot, 03 June 2021.
- Tso. 2021. UJ student, Soweto, 31 May 2021.
- Xu. 2021. UJ student, Soweto, 31 May 2021.

Self-Assessment of Physiotherapy Students' Competence During the COVID-19 and Non-COVID-19 Pandemic in Slovenia: A Retrospective Cross-Sectional Case-Control Study

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Abstract: Competency-based higher education aims to equip students with the knowledge, skills, values and attitudes necessary for professional practice and lifelong learning. The COVID-19 pandemic has led to significant adjustments in teaching, assessment and clinical education. This study compares the self-assessed professional competences of graduates of the Faculty of Health Sciences at the University of Ljubljana who graduated during the COVID-19 pandemic with those who graduated before the pandemic. Using a structured survey, the graduates assessed 13 core competences that they had acquired during their academic education and clinical practise. Descriptive and inferential statistical methods were used to compare the cohorts. Although no statistically significant differences in overall competency scores were found between groups, pandemic-era graduates reported slightly lower confidence in competencies acquired through academic training and slightly higher confidence in competencies acquired through clinical practise. Our findings suggest that the blended learning approaches introduced during the pandemic are as effective as traditional face-to-face teaching in promoting skills development. However, the generalisability of the results to the studied group of physiotherapy graduates is limited. The results support further research into virtual and hybrid learning models in physiotherapy education.

Keywords: online teaching and learning; pandemic; physiotherapy, student

Introduction

In the last two decades, competence-based education has been widely discussed and researched in higher education. Within this context, the Bologna Process was a significant reform initiative designed to restructure higher education in the European Union (EU), focusing on quality assurance, employability, and expanding access (Vissers et al., 2014). Competency-based education does not focus solely on isolated knowledge and skills, but on the holistic application of knowledge, skills, attitudes, behaviours, integrated and internalized abilities, and on ensuring effective performance in an individual's professional tasks (Baartman & Ruijs, 2011). A set of standardized descriptions that allow for a clear and comparative understanding of the levels of acquired competencies of students in various higher education programs and institutions in Europe are provided by the Dublin Descriptors. These descriptors serve as markers of the difficulty levels of the Bologna cycles (undergraduate, postgraduate, and doctoral) within the European Qualifications Framework (EQF) in the European Higher Education Area. They refer to the following five dimensions: “knowledge and understanding”, “application of knowledge and understanding”, “judgment ability”, “communication skills”, and “lifelong learning skills” (EQF, 2017). In 2008, Slovenia began developing the Slovenian Qualifications Framework (SQF) in order to implement the recommendations of the European Parliament and the Council of the EU on the introduction of the EQF. In Slovenia, it is mandatory for all higher education institutions to clearly outline the specific competences that students should develop by the time they complete their studies and obtain their degree. This requirement ensures that the educational objectives are in line with the Slovenian Qualifications Framework (SOK, 2020), which serves as a standardised benchmark for measuring students' competences in various qualifications. By defining these competences, the institutions aim to ensure that graduates have the necessary skills and knowledge to succeed in their respective fields and meet the demands of the labour market. This framework not only helps to maintain a high standard of education, but also facilitates the transparency and comparability of qualifications, both nationally and internationally.

With the outbreak of the Coronavirus disease in 2019 (COVID-19), a public health emergency of international concern was declared on January 30, 2020 (WHO, 2020), leading to the adoption of numerous safety measures worldwide, including the closure of

educational institutions. The pandemic affected more than 80% of the global student population (Aristovnik et al., 2021; Niranjana, 2020). There is no doubt that the COVID-19 pandemic has put academic systems around the world to the test and forced universities to quickly shift from traditional forms of education to online education. The study of physiotherapy at the Faculty of Health Sciences at the University of Ljubljana – Slovenia (FHS UL) was no exception. The declaration of a global pandemic by the World Health Organization on March 11, 2020, led to emergency protocols at national and institutional levels, including the widespread closure of universities and a rapid shift to distance learning. The transition was abrupt and the FHS UL was faced with the challenge of maintaining the quality of education. As governments mandated physical distancing and public health measures, FHS UL's academic programs had to revise curricula, adjust assessment methods, and postpone or restructure clinical placements.

With no time for extensive training on online teaching and learning and no opportunity to modify the study program content, physiotherapy teachers and students faced the challenge of effectively teaching and learning with the online pedagogical approach while ensuring the same level of acquired competencies as students did before the pandemic (Ng et al., 2021; Rossettini et al., 2017). Physiotherapy is a profession that requires the acquisition of practical skills to develop patient assessment skills and implement the physiotherapy process (WCPT, 2020). During the pandemic, theoretical knowledge could be delivered online, while the practical components of physiotherapy education were more difficult to replicate.

The COVID-19 pandemic had a significant impact on physiotherapy students' competence in several ways. Studies have shown that the pandemic led to a perceived decline in confidence and competence among healthcare students (Wilcha, 2020), including those in physiotherapy. Chesterton et al. (2022) assessed the perceptions of physiotherapy students (n = 236) regarding the transition to virtual study, with 79% of students stating that it negatively affected their understanding of the study material due to a lack of hands-on skills, 67% were less motivated to study compared to the traditional method, and 55% reported that academic staff lacked the necessary knowledge to deliver study content online. Hilburg et al. (2020) argued that the lack of face-to-face teaching for skills, such as history taking and physical examinations, would negatively impact students' transition to their clinical years. Salim Kazi Hakim et al. (2021) studied which mode of study (traditional, virtual, and blended) was more suitable for physiotherapy

students (n = 138) and found that while students enjoyed online assignments, they rated the traditional mode of teaching and learning better. The authors concluded that a balanced approach to the choice of study mode is very important for learning outcomes and student success. Ng et al. (2021) reported that the transition to a full e-learning approach in an undergraduate physiotherapy programme during the COVID-19 pandemic resulted in undergraduate students experiencing increased negative emotions due to overuse of information technology, reduced motivation and overload. Students valued face-to-face practical classes to learn and receive social support from peers and tutors.

To the author's knowledge, no study to date has examined FHS UL physiotherapy students' perceptions of self-assessed acquired competencies during the COVID-19 pandemic, and therefore our study aims to be the first to investigate this. Accordingly, the aim of this retrospective cross-sectional case control study is to present the self-assessment of acquired competencies of physiotherapy students who completed their studies at the FHS UL during the COVID-19 pandemic and to compare them with the group of students who underwent the same course delivered before the COVID-19 pandemic.

Methodology

In this study, a retrospective cross-sectional case-control design was used, allowing comparison between student cohorts educated before and during the COVID-19 pandemic. This design is well suited to identify differences in self-perceived competency development in different educational contexts, particularly those that have been influenced by emergency-related changes in policy and pedagogy.

1. Participants

Students who attended the course in the academic years 2019/2020, 2020/2021, 2021/2022 and 2022/2023 were considered as the COVID-19 online group. For this study, the COVID-19 group was defined as students who were exposed to educational disruptions caused by the COVID-19 pandemic at any point during their three years of education. These disruptions included online classes, adjusted assessment methods and postponed or restructured clinical placements. Although data collection took place in spring 2022 (March–April), students from the 2022/2023 cohort were included if they

were continuing their studies in that academic year (e.g., students preparing to graduate). These individuals had already experienced online teaching in earlier years of their studies. As students from different academic years were affected to varying degrees, we did not stratify participants by academic year. Data were collected from March 28 to April 28, 2022.

Students who had attended the same face-to-face course in the 2013/2014 and 2014/2015 academic years were considered as a control group as a pre-COVID group. They were selected based on their curricular stability prior to significant digital integration or the impact of the pandemic, and represent periods of stable, traditional teaching prior to digital transformation or pandemic-related interruptions. Data from this group were collected from February 18 to March 17, 2015.

The study received approval from the Medical Ethics Committee of the Republic of Slovenia (document number: 0120-105/2022/6).

2. Data collection and measurement instrument

A quantitative study approach with a survey was conducted. The survey was distributed electronically via the social network Facebook and the online application 1KA to students who met the inclusion criteria. Before completing the questionnaire, participants were given an introduction in which they were assured that their participation was voluntary and that their data would be kept strictly confidential. The survey consisted of two parts. The first part included open-ended demographic questions and additional closed-ended questions for the COVID-19 online group about the amount of face-to-face teaching time at FHS UL and in clinical settings during all three years of their studies. Response options were provided as “entirely”, “more than half time”, “half time” and “less than half time”. The second part of the survey comprised self-assessment of the competences defined in the Bachelor's degree programme in Physiotherapy at FHS UL¹. All cohorts responded to the same standardized survey instrument, which included self-assessment of 13 core competencies, metrics assessing perceived competencies and items aligned with national qualification frameworks (SQF/EQF). No variations in survey content were introduced across cohorts. The language and format remained consistent to ensure comparability.

¹ <https://www.zf.uni-lj.si/si/studenti/studijski-programi/1-stopnja/1-stopnja-fizioterapija>

In the questionnaire, the competences were introduced as: “Competences refer to a set of knowledge, skills, attitudes and behaviours that students are expected to acquire and demonstrate by the end of their educational programme. They are designed to ensure that graduates are prepared to meet the demands of their chosen professions and to engage as informed and effective individuals”. The questions were closed-ended, asking graduates to rate how well they believed they acquired the listed competences at FHS UL (through lectures, seminars, and lab exercises) and in clinical settings (through clinical practice). Response options were provided on a five-point Likert scale ranging from 1 to 5, where 1 – not at all, 2 – little, 3 – moderately, 4 – well, 5 – very well.

3. Statistical analysis

The data were analysed using IBM SPSS Statistics 22 (IBM Corporation, USA). Descriptive statistics were used to present demographic data with mean values, standard deviations and frequency distributions. The differences in competences acquired at FHS UL and in the clinical setting between the COVID-19 online and pre-COVID-19 groups were calculated using Student’s t-test for independent samples. Means, standard deviations, confidence intervals and Cohen’s d were calculated for the scores of the competences acquired. Cohen’s d – effect size, indicate the magnitude of the difference between the groups and is interpreted as follows: 0.2 - small effect size, 0.5 - medium effect size, 0.8 - large effect size. The level of statistical significance was set at $p \leq 0.05$.

Results

1. Participants

The survey was sent to 78 graduates of the COVID-19 online group, 50 of whom completed and returned the survey (response rate = 64%). It was also sent to 118 graduates of the pre-COVID-19 group, 53 of whom completed and returned the survey (response rate = 45%). The demographic characteristics of the respondents are presented in Table 1.

Table 1: Demographic characteristics of respondents

| Group | N | Mean Age in years (SD) | N (%) Gender | Total N |
|-----------------|----|------------------------|------------------------------|---------|
| COVID-19 online | 50 | 23.36 (0.85) | 12 (24.0%) M 38 (76.0%) F | 50 |
| Pre-COVID-19 | 53 | 23.80 (1.20) | 8 (15.1%) M 45 (84.9%) F | 53 |

N – number, SD – standard deviation, M – male, F – female.

2. Amount of face-to-face teaching time

In the first year of study in the COVID-19 online group, 98% (n= 49) of students reported that their study programme took place entirely face-to-face at the FHS UL and in a clinical setting.

In the second year of study, 54% (n= 27) of students stated that they completed half of their study programme face-to-face and 2% (n=1) of students stated that they completed their studies entirely face-to-face at FHS UL. Practical training took place entirely face-to-face in the clinical environment for 38% (n=19) of students.

In the third year of study, one student stated that he/she completed his/her studies entirely in the face-to-face at the FHS UL. 56% (n=28) of the students stated that half of their studies took place face-to-face at FHS UL. 34% (n=17) of students indicated that practical training in various clinical settings was entirely face-to-face, 52% (n=26) of students indicated that more than half of the time was face-to-face and 6% (n=3) of students indicated that they studied less than half of the time face-to-face.

For the pre-COVID-19 group, the study programme was conducted completely face-to-face at the FHS UL and in clinical settings for all students.

4. Self-assessment of acquired competences

When comparing all self-assessed competences between the COVID-19 online and pre-COVID-19 groups, the analyses showed that although there were slight differences between the groups, these differences were not statistically significant and had only small effect sizes (Table 2).

Table 2: Self-assessment of all acquired competencies

| Category | Group | Mean (SD) | 95% CI | t | p | Cohen's d |
|---|-----------------|-------------|-------------|-------|------|-----------|
| All competences acquired at FHS UL + clinical environment | COVID-19 online | 3.45 (1.08) | 3.06 - 3.84 | -0.56 | 0.58 | -0.14 |
| | Pre-COVID-19 | 3.58 (0.68) | 3.34 - 3.82 | | | |
| All competences acquired at FHS UL | COVID-19 online | 3.06 (1.11) | 2.66 - 3.46 | -1.44 | 0.06 | -0.37 |
| | Pre-COVID-19 | 3.41 (0.74) | 3.15 - 3.67 | | | |
| All competences acquired in clinical environment | COVID-19 online | 3.84 (0.90) | 3.52 - 4.16 | 0.49 | 0.63 | 0.13 |
| | Pre-COVID-19 | 3.74 (0.68) | 3.50 - 3.98 | | | |

SD - standard deviation, CI - confidence interval

The average self-assessed scores of the individual competence acquired at the FHS UL, were lower in the COVID-19 online group than in the pre-COVID-19 group, except for two competences (Q10 and Q11; Table 3). Overall, the pre-COVID-19 group generally scored higher. For three competences (Q2, Q4 and Q13; Table 3), the differences were statistically significant ($p = 0.002, 0.005, 0.010$ for Q13, Q2, Q4, respectively) compared to the pre-COVID-19 group (Table 3). The negative signs show that the COVID-19 group rated their competencies lower than the pre-COVID-19 group. An effect size in this ranges suggests a modest difference between the groups.

Table 3: The comparison of the self-assessed individual competences acquired at the FHS UL between the two groups of respondents

| Individual competence acquired at FHS UL | COVID-19 online group Average (SD) 95% CI | Pre-COVID-19 group Average (SD) 95% CI | t | Cohen's d | p |
|---|---|--|-------|-----------|--------|
| Q 1. Ability to apply theoretical knowledge in developing, maintaining, and restoring movement and functional abilities in individuals with limited or impaired movement due to illness or injury across all age groups | 3.04 (0.83) 2.80 - 3.28 | 3.38 (1.00) 3.10 - 3.66 | -1.84 | -0.37 | 0.066 |
| Q 2. Ability to analyse and solve professional problems using knowledge, skills, behaviour, and ethical values | 2.70 (1.02) 2.41 - 2.99 | 3.31 (1.09) 3.01 - 3.61 | -2.95 | -0.58 | 0.005* |
| Q 3. Ability to connect evidence-based theory and integrate it into practice | 2.96 (1.01) 2.67 - 3.25 | 3.21 (1.06) 2.92 - 3.50 | -1.22 | -0.24 | 0.226 |
| Q 4. Ability to develop critical and self-critical judgment in planning, implementing, and evaluating the physiotherapy process | 2.82 (0.92) 2.56 - 3.08 | 3.34 (1.04) 3.05 - 3.63 | -2.68 | -0.53 | 0.010* |
| Q 5. Knowledge, understanding, and consideration of indications and contraindications, as well as adverse effects of | 3.42 (1.13) 3.10 - 3.74 | 3.75 (0.98) 3.48 - 4.02 | -1.55 | -0.31 | 0.121 |

| Individual competence acquired at FHS UL | COVID-19 online group Average (SD) 95% CI | Pre-COVID- 19 group Average (SD) 95% CI | t | Cohen's d | p |
|---|--|--|-------|-----------|--------|
| physiotherapy in specific professional problems | | | | | |
| Q 6. Ability to self-critically and critically judge, analyse, and evaluate physiotherapy procedures and one's own work | 3.18 (1.00) 2.90 - 3.46 | 3.42 (0.96) 3.16 - 3.68 | -1.21 | -0.25 | 0.220 |
| Q 7. Ability to communicate orally and in writing with colleagues and professionals from other disciplines (including in an international context) | 2.74 (1.08) 2.43 - 3.05 | 3.13 (1.27) 2.78 - 3.48 | -1.76 | -0.33 | 0.099 |
| Q 8. Ability to collaborate in an interdisciplinary team | 2.78 (1.27) 2.42 - 3.14 | 3.15 (1.29) 2.79 - 3.51 | -1.53 | -0.29 | 0.149 |
| Q 9. Ability to understand and use critical analysis and theory development and apply them to solve specific professional problems | 3.06 (0.93) 2.80 - 3.32 | 3.13 (0.94) 2.87 - 3.39 | -0.37 | -0.07 | 0.706 |
| Q 10. Ability to effectively promote physical activity across all life stages in the narrower and broader community | 3.24 (1.33) 2.86 - 3.62 | 3.23 (1.15) 2.91 - 3.55 | 0.04 | 0.01 | 0.968 |
| Q 11. Ability to search for new information in the literature in the field of physiotherapy and other sciences (medical, organizational sciences, informatics, and social sciences) and integrate them into physiotherapy | 3.88 (0.87) 3.63 - 4.13 | 3.85 (0.95) 3.59 - 4.11 | 0.16 | 0.03 | 0.868 |
| Q 12. Ability for independent learning in and responsibility for one's own learning and awareness of the importance of lifelong learning | 3.88 (0.92) 3.62 - 4.14 | 4.00 (0.96) 3.74 - 4.26 | -0.63 | -0.13 | 0.520 |
| Q 13. Ability to report new findings at professional meetings, in professional and popular publications, and in the media | 3.14 (1.07) 2.84 - 3.44 | 3.85 (1.15) 3.53 - 4.17 | -3.31 | -0.64 | 0.002* |

SD - standard deviation, CI - confidence interval, * statistically significant

The average self-assessed scores of the individual competencies acquired in the clinical environment were higher in the COVID-19 group compared to the pre-COVID-19 group for eight competences (Q2– Q4, Q7– Q11; Table 4), the difference was statistically significant ($p = 0.010$) only for one competence (Q13; Table 4).

Table 4: The comparison of self-assessed individual competences acquired in the clinical environment between the two groups of respondents

| Individual competence acquired in the clinical environment | COVID-19 online group Average (SD) 95% CI | Pre-COVID-19 group Average (SD) 95% CI | t | Cohen's d | p |
|---|---|--|--------|-----------|------------------|
| Q1. Ability to apply theoretical knowledge in developing, maintaining, and restoring movement and functional abilities in individuals with limited or impaired movement due to illness or injury across all age groups | 4.00 (0,53) 3.85 - 4.15 | 4.02 (0,78) 3.81 - 4.23 | -0.137 | -0.03 | 0.879 |
| Q 2. Ability to analyse and solve professional problems using knowledge, skills, behaviour, and ethical values | 3.72 (0,78) 3.50 - 3.94 | 3.45 (0,93) 3.19 - 3.71 | 1.538 | 0.31 | 0.113 |
| Q 3. Ability to connect evidence-based theory and integrate it into practice | 3.80 (0,90) 3.54 - 4.06 | 3.60 (0,95) 3.34 - 3.86 | 1.067 | 0.22 | 0.275 |
| Q 4. Ability to develop critical and self-critical judgment in planning, implementing, and evaluating the physiotherapy process | 3.94 (0,77) 3.72 - 4.16 | 3.91 (0,86) 3.67 - 4.15 | 0.176 | 0.04 | 0,861 0.852 |
| Q 5. Knowledge, understanding, and consideration of indications and contraindications, as well as adverse effects of physiotherapy in specific professional problems | 3.92 (0,70) 3.72 - 4.12 | 3.96 (0,85) 3.73 - 4.19 | -0.244 | -0.05 | 0,808 0.794 |
| Q 6. Ability to self-critically and critically judge, analyse, and evaluate physiotherapy procedures and one's own work | 3.76 (0,96) 3.49 - 4.03 | 3.83 (0,91) 3.58 - 4.08 | -0.365 | -0.07 | 0,716 0.705 |
| Q 7. Ability to communicate orally and in writing with colleagues and professionals from other disciplines (including in an international context) | 3.78 (0,95) 3.51 - 4.05 | 3.49 (1,06) 3.20 - 3.78 | 1.461 | 0.29 | 0,147 0.146 |
| 8. Ability to collaborate in an interdisciplinary team | 4.10 (0,91) 3.84 - 4.36 | 4.04 (1,12) 3.73 - 4.35 | 0.304 | 0.06 | 0,762 0.765 |
| Q 9. Ability to understand and use critical analysis and theory development and apply them to solve specific professional problems | 3.68 (0,79) 3.46 - 3.90 | 3.33 (1,11) 3.02 - 3.64 | 1.877 | 0.36 | 0,064 0.067 |
| Q 10. Ability to effectively promote physical activity across all life stages in the narrower and broader community | 3.80 (0,99) 3.52 - 4.08 | 3.72 (1,16) 3.40 - 4.04 | 0.386 | 0.07 | 0,700 0.707 |
| Q 11. Ability to search for new information in the literature in the field of physiotherapy and other sciences (medical, organizational sciences, informatics, and social sciences) and integrate them into physiotherapy | 3.62 (0,95) 3.35 - 3.89 | 3.51 (1,10) 3.21 - 3.81 | 0.584 | 0.11 | 0,584 0.588 |
| Q 12. Ability for independent learning in and responsibility for one's own learning and awareness of the importance of lifelong learning | 4.06 (0,74) 3.85 - 4.27 | 4.15 (1,04) 3.86 - 4.44 | -0.504 | -0.10 | 0,615 0.612 |
| Q 13. Ability to report new findings at professional meetings, in professional and popular publications, and in the media | 3.20 (1,05) 2.90 - 3.50 | 3.75 (1,08) 3.45 - 4.05 | -2.671 | -0.52 | 0,009* 0.010* |

SD standard deviation, CI - confidence intervals, * statistically significant

Discussion

The primary objective of this study was to evaluate how physiotherapy students at the Faculty of Health Sciences, University of Ljubljana (FHS UL), self-assessed the competencies they acquired during the COVID-19 pandemic. Additionally, we sought to compare these self-assessments with those of graduates who completed their studies before the pandemic. The competencies explored in our survey align with the World Physiotherapy guidelines, which outline the essential skills expected of physiotherapists entering the workforce post-graduation (WCPT, 2020; WP 2012, 2022). These competencies encompass several critical areas, including general skills, physiotherapy assessment, and the implementation of the physiotherapy process. Moreover, they cover professionalism, health promotion, research, self-directed learning, teaching, and an understanding of the significance of lifelong learning. The survey also addressed the promotion of the physiotherapist's role within the healthcare system's function and structure. Through this study, we aim to provide insights into how the pandemic has impacted the development of these vital competencies in emerging physiotherapists.

The average scores in the self-assessment of all competences acquired in a clinical setting were higher for our respondents in both groups than the scores in the self-assessment of competences acquired at the FHS UL. This indicates that the students acquired their competences more effectively through practical work in different work situations. Although the self-assessment of competences in the COVID-19 online group was lower than in the pre-COVID-19 group, but not statistically significant, this can probably be attributed to the fact that, despite the restrictions during the pandemic, students had the opportunity to perform a considerable number of clinical exercises in a practical setting, which allowed them to apply their theoretical knowledge, gain practical experience and develop essential skills necessary for their professional growth in a real healthcare environment. As a result, students did not lack practical skills and experiential learning, which had a significant impact on their understanding of the subject matter, as confirmed by other authors (Salim Kazi Hakim et al., 2021; Chesterton et al., 2022). However, it is important to note that these results are based on the students' self-perception, which was collected in a survey. While this perspective provides valuable insight into students' confidence in their competences, it does not capture objective performance data. Future research should incorporate complementary metrics — such

as the exact number and duration of clinical trainings attended, frequency of placements and assessment protocols — to provide a more comprehensive assessment. In addition, detailed contextual information on changes to the curriculum, assessment methods and guidelines for clinical placements at the FHS UL during the pandemic would help to clarify how the institutional adjustments may have influenced students' learning experiences.

Learning through direct experience and reflection on these experiences is crucial for the development of competences. During clinical practice, students are involved in real-life scenarios that provide a deeper and broader understanding of the complexity of the workplace and allow students to apply theoretical knowledge to different practical situations and improve their problem-solving skills. In addition, students can more easily compare their competences with the requirements of the work process and the competence level of other, more experienced employees (Korpi et al., 2017). However, this does not mean that the role of educational institutions and curricula is neglected, as all the fundamentals of practical work, the “heart” of the profession — the knowledge of the structure and functioning of human movement and the therapeutic tools to maintain and restore functional abilities — are still acquired by students in the educational institution. The structured and comprehensive education provided by the educational institutions is essential for equipping students with the necessary theoretical knowledge and initial skills that they can then refine and expand upon through experiential learning in clinical settings.

The average scores of the self-assessment of all competences acquired at the FHS UL were lower for most competences for respondents in our COVID-19 online group compared to respondents in the pre-COVID-19 group. This result was to be expected as students had to adapt unexpectedly and quickly to the online delivery of theoretical content as well as the acquisition of certain practical skills that normally take place in the faculty's laboratory facilities. Although e-learning has now become an indispensable part of education, combining pedagogical, computer-based and communicative knowledge, and is constantly evolving (George et al., 2017), authors have reported negative experiences with e-learning among physiotherapy students during the COVID-19 pandemic. Students were anxious, stressed (Sahu, 2020), felt overloaded (Händel et al., 2020) and had less motivation to learn (Chesterton et al., 2022). They value face-to-face learning as it provides social support and allows feedback from peers and teachers (Salim

Kazi Hakim et al., 2021). While students were reasonably open to online lectures, they were very opposed to not being able to acquire practical skills directly and in person. In their opinion, e-learning should encourage the development of healthy study habits, such as scheduled time to study, physical exercise and other activities that reduce stress (Sahu, 2020; Niranjana, 2020).

When analysing the scores for the individual competences, the students in both groups in our study at the FHS UL acquired low to moderate competences in the areas of developing critical and self-critical judgement, planning, implementing and evaluating the physiotherapy process and competences in professionalism. Professionalism in this context refers to the ability to analyse and solve professional problems by applying knowledge, skills and behaviours and adhering to ethical values (WCPT, 2020). Acquiring these competences in a supervised environment — such as classrooms, laboratory exercises and simulations — is crucial in education, as such situations approximate the real working environment. However, these situations do not predict actual acquisition of skills and success in clinical practice (Brosky & Scott, 2007; Timmerberg et al., 2022). The clinical environment or workplace is the place where a person develops their knowledge and skills and where their competence can also be assessed (Cate & Billett, 2014).

According to self-assessment, our students in the COVID-19 online group have acquired the ability to apply theoretical knowledge about the development, maintenance and recovery of movement and functional abilities just as well as the pre-Covid group. This was also observed in the self-assessment of the ability to search for and integrate new information from the literature in the field of physiotherapy and related disciplines (medicine, organisational, computer and social sciences). During the pandemic, FHS UL transitioned the lectures to an online-only format and students had to adapt to new teaching and learning methods; the transition had to be quick and efficient (Sahu, 2020). It seems that our COVID-19 online group students' adaptation to the virtual learning environment emphasises their resilience and ability to overcome unprecedented challenges. The study of Kamarianos et al. (2020) confirmed that in a given situation, being a student (Generation Z), thus digitally much more literate than previous generations, helped considerably in overcoming the difficulties of the transition from onsite to online learning. This observation is supported by findings from other authors (Aristovnik et al., 2021), who have similarly noted the efficacy of online learning during the pandemic.

The ability to learn independently and take responsibility for their own learning, as well as an awareness of the importance of lifelong learning, were competences that the students in both groups felt they had acquired well at FHS UL and in the clinical environment. Taking responsibility for one's own learning was crucial during the COVID-19 pandemic. Studying from home usually requires more self-discipline and motivation to follow online classes, especially in the initial period when students are getting used to the new system. Compared with traditional in-class lectures, faculty have less control over online teaching, and students are more likely to "skip the class". Therefore, the progress of online teaching and its learning effectiveness largely depend on students' high-level of self-discipline (Bao, 2020). The mechanism of self-discipline in online learning is self-directed and online courses require a high degree of self-control (Zhu et al., 2022). On the other hand, lecturers who are not familiar with the new teaching method might overload their students with study materials and assignments which evokes a feeling of work overload and thus a higher level of stress (Händel et al., 2020). Lecturers should therefore pay careful attention to the balance between online teaching and self-study when planning and organising the teaching and learning process (Aristovnik et al., 2021).

Limitation of the study

Our study had some limitations. The first is the measurement instrument – a questionnaire usually used for self-assessment of the observed research question, in our case acquired competences. Braun et al. (2011) point out an important limitation of studies that rely heavily on self-assessments: the inherent subjectivity and potential inaccuracies in participants' assessment of their own abilities. This discrepancy becomes particularly clear when comparing students' responses to the surveys with the competences they acquired, as emphasised by Korpi et al. (2017). The discrepancy between perceived and actual competences suggests that students' self-reported knowledge and skills do not correlate strongly with objective measures determined by standardised tests or institutional assessment methods (Humburg & van der Velden, 2015). Despite this discrepancy, Braun et al. (2011) find that students' self-assessments are positively related to their academic motivation, learning behaviour and overall

academic success, suggesting that perceptions of competence may play a crucial role in educational outcomes, regardless of actual knowledge levels.

Secondly, the scope of our study was limited to a single institution, which limits the generalisability of our findings to the entire population of physiotherapy graduates in Slovenia during the COVID-19 pandemic. The characteristics of the institution and its students may not reflect those of other educational institutions, making it difficult to apply our findings broadly. Therefore, to gain a more comprehensive understanding of how physiotherapy students in Slovenia self-assessed their acquired competences during the pandemic, further research should be conducted at a variety of educational institutions offering physiotherapy programmes. Such studies would provide valuable insights into possible differences and similarities in students' experiences and self-assessments in different contexts enhancing the overall understanding of the impact of the pandemic on physiotherapy education in Slovenia.

Primary takeaways from the study

The main results show that there were no statistically significant differences in self-assessed overall skills between the pre-pandemic and pandemic cohorts. This suggests that despite the disruption caused by COVID-19, the adjustments in teaching and clinical training — particularly the shift to blended learning and online learning — did not have a negative impact on the perceived development of key professional competences. Graduates from both groups reported greater confidence in the competences acquired through clinical practise than those acquired through academic teaching. This emphasises the crucial role of practical learning in skills development. Although the pandemic cohort rated their academic learning experiences slightly lower, this did not result in a significant deficit in overall competence. Our results underline the potential effectiveness of blended learning models in physiotherapy education and suggest that the curricula are resilient in times of crisis. However, the study relied on self-reported data reflecting personal perceptions rather than objective performance. To strengthen future research, the inclusion of complementary objective indicators — such as clinical training hours, evaluation results and institutional data on curriculum adjustments — is recommended. In conclusion, the study supports the continued integration of virtual and hybrid learning environments while emphasizing the need to

preserve access to clinical placements to maintain the quality of competency-based health education.

Policy implications

Virtual teaching for physiotherapy students has enabled physiotherapy education to continue despite the effects of the pandemic. The COVID-19 outbreak has provided faculties with the perfect opportunity to develop and further the application and effectiveness of virtual learning for physiotherapy students. Physiotherapy faculties should embrace the transition to virtual teaching and continue to develop web-based materials and resources with increased student interactivity, to ensure that the most effective and suitable teaching is delivered. Overall, while the COVID-19 pandemic posed significant challenges to physiotherapy education, it also accelerated the adoption of innovative teaching methods and highlighted the need for flexible and resilient educational frameworks.

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References

- Aristovnik, A., Keržič, D., Ravšelj, D., Tomaževič, N., Umek, L. (2021). Impacts of the Covid-19 pandemic on life of higher education students: global survey dataset from the first wave. *Data Brief* 39:107659. <https://doi.org/10.1016/j.dib.2021.107659>.
- Baartman, L., Ruijs, L. (2011). Comparing students perceived and actual competence in higher vocational education. *Assessment & Evaluation in Higher Education* 36(4): 385–98.
- Bao, W. (2020). COVID-19 and online teaching in higher education: a case study of Peking University. *Human Behaviour and Emerging Technologies*, 2(2), 113–115. <https://doi.org/10.1002/hbe2.191>.

- Braun, M.P.E., Sheikh, H., Hannover, B. (2011). Self-rated competences and future vocational success: a longitudinal study. *Assessment & Evaluation in Higher Education*, 36(4): 417–27. <https://doi.org/10.1080/02602938.2010.534762>.
- Cate, T.O. & Billett, S. (2014). Competency-based medical education: origins, perspectives, and potentialities. *Medical Education*, 48(3): 325–32.
- Chesterton, P., Richardson, M., Tears, C. (2022). Student physiotherapists perceptions of online curriculum delivery during the COVID-19 pandemic. *BMC Medical Education*, 22 (1): 440. <https://doi.org/10.1186/s12909-022-03486-5>.
- EQF (2017). Descriptors defining levels in the European Qualifications Framework. <https://ec.europa.eu/ploteus/en/content/descriptors-page>, <5. 2. 2021>.
- George, P.P., Papachristou, N., Belisario, J.M., Wang, W., Wark, P.A., Cotic Z., Rasmussen, K., Sluiter, R., Riboli-Sasco, E., Tudor, Car L., Musulanov, E.M., Molina, J.A., Heng, B.H., Zhang, Y., Wheeler, E.L., Al Shorbaji, N., Majeed, A., Car J. (2014). Online eLearning for undergraduates in health professions: a systematic review of the impact on knowledge, skills, attitudes, and satisfaction. *Journal of Global Health* 4(1): 010406.
- Händel, M., Stephan, M., Gläser-Zikuda, M., Kopp, B., Bedenlier, S., & Ziegler, A. (2020). Digital readiness and its effects on higher education students' socio-emotional perceptions in the context of the COVID-19 pandemic. *Journal of Research on Technology in Education*, 54(2), 267–280. <https://doi.org/10.1080/15391523.2020.1846147>.
- Hilburg, R., Patel, N., Ambruso, S., Biewald, M.A. & Farouk, S.S. (2020). Medical education during the Coronavirus disease-2019 pandemic: learning from a distance. Forthcoming. *Advances in Chronic Kidney Disease*, 27, (5), 412-417. <https://doi.org/10.1053/j.ackd.2020.05.017>.
- Humburg, M., & van der Velden, R. (2015). Self-assessments or tests? Comparing cross-national differences in patterns and outcomes of graduates' skills based on international large-scale surveys. *Studies in Higher Education* 40(3): 482–504. <https://doi.org/10.1080/03075079.2015.1004237>.
- Kamarianos, I., Adamopoulou, A., Lambropoulos, H. & Stamelos, G. (2020). Towards and understanding of university students' response in times of pandemic crisis (COVID-19). *European Journal of Education Studies*, 7, 20–40. <https://doi.org/10.46827/ejes.v7i7.3149>.

- Korpi, H., Piirainen, A., Peltokallio, L. (2017). Practical work in physiotherapy students' professional development. *Reflective Practice* 18(6): 821–36. <https://doi.org/10.1080/14623943.2017.1361920>.
- Ng, L, Seow, K.C., MacDonald, L., Correia, C., Reubenson, A., Gardner, P., Spence, A.L., Bunzli, S., De Oliveira, B.I.R. (2021). eLearning in physical therapy: lessons learned from transitioning a professional education program to full eLearning during the COVID-19 pandemic. *Physical Therapy*, 101 (4): 1-9. <https://doi.org/10.1093/ptj/pzab082>.
- Niranjan, P. (2020). Corona virus pandemic impact on global education: a blessing in disguise. *Sustainable Humanosphere*, 16: 68–72.
- Rossettini, G., Rondoni, A., Palese, A., Cecchetto, S., Vicentini, M., Bettale, F., Furri, L., Testa, M. (2017). Effective teaching of manual skills to physiotherapy students: a randomized clinical trial. *Medical Education*, 51(8): 826–38.
- Sahu, P. (2020). Closure of universities due to Coronavirus disease 2019 (COVID-19): impact on education and mental health of students and academic staff. *Cureus* 12(4): e7541. <https://doi.org/10.7759/cureus.7541>.
- Salim Kazi Hakim, S., Satish Devare Phadke, S., Tilak, P. (2021). Physiotherapy student's preference for learning during COVID-19 pandemic. *Turkish Journal of Physiotherapy and Rehabilitation*, 32(3): 6688–93.
- SOK (2020). Slovensko ogrodje kvalifikacij. <https://www.nok.si/kvalifikacije/diplomirani-fizioterapevt-vs-diplomirana-fizioterapevtka-vs>, <8. 9. 2023>.
- Timmerberg, J.F., Chesbro, S.B., Jensen, G.M., Dole, R.L., Jette, D.U. (2022). Competency-based education and practice in physical therapy: it's time to act! *Physical Therapy*, 102(5): pzac018. <https://doi.org/10.1093/ptj/pzac018>.
- Vissers, D., Daele, U.V., de Hertogh, W., de Meulenaere, A., Denekens, J. (2014). Introducing competency-based education based on the roles that physiotherapists fulfil. *Journal of Novel Physiotherapy and Physical Rehabilitation*, 1(3):110 1(3):110. <https://doi.org/10.17352/2455-5487.000010>.
- WCPT – World Confederation for Physical Therapy (2020). Expected minimum competencies for an entry level physiotherapist in the Europe Region World Physiotherapy guidance document.

https://www.erwcpt.eu/education/expected_minimum_competencies_for_entry_level, <13. 4. 2020>.

WP - World Physiotherapy - Europe region. (2022). Guidance Document on Expected Minimum Competencies for an Entry-Level Physiotherapist in the Europe region. <https://www.erwcpt.eu/minimum-competencies> <25. 7. 2024>.

WP - World Physiotherapy. (2021). *Physiotherapist education framework*, World Physiotherapy, London.

WHO (30.1.2020). Director-general's statement on IHR emergency committee on novel coronavirus (2019-nCoV). World Health Organization Website. [https://www.who.int/director-general/speeches/detail/who-director-general-s-statement-on-ihf-emergency-committee-on-novel-coronavirus-\(2019-ncov\)](https://www.who.int/director-general/speeches/detail/who-director-general-s-statement-on-ihf-emergency-committee-on-novel-coronavirus-(2019-ncov)), <26. 9. 2023>.

Zhu, J., Zhao, H., Wang, X., Yang, L., Qin, Z., & Geng, J. (2022). Effects of online learning on college students in Eastern China: a structural equation model. *Frontiers in Public Health*, 10, 853-928. <https://doi.org/10.3389/fpubh.2022.853928>.