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Predictive performance of higher education students: the role of tutor attributes

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Abstract: Pedagogical approaches influence student performance. This study examines the extent to which student performance is impacted by aspects such as tutor work ethic, personality, and content delivery, which are yet to be fully theorised from an educational context. Data was collected from 114 first- and second-year students in the business faculty of a higher education institution in South Africa. An artificial neural network (ANN) was used to complement correlation analysis findings and examine the importance of specific tutor qualities and student experiences on overall student performance. Results showed that self-directed learning actions such as self-planning, self-regulation and self-evaluation were significant predictors of overall student performance. The study provided substantial evidence for improving the tutoring function to enhance students' performance.

Keywords: academic achievement; learning; neural networks; student performance; tertiary institutions; tutoring.

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1 Introduction

Across the world, educational experts have continuously devised ways to improve student performance. While student performance has always depended on numerous factors, such as its relationship with teaching efficiency, it remains a subject of great interest. Studies

have demonstrated that improved pedagogical skills significantly influence student performance (Hawas and Alani, 2021; Marie, 2021). More so, rapid technological advancement has reshaped the educational landscape and highlighted the need for blended learning environments and contemporary resources to aid academic achievement.

Conscious of the need to offer a more supportive student environment, educational institutions in developing countries are leveraging technological innovations and adopting new pedagogical approaches to learning, combining the traditional face-to-face approaches with broader use of online or virtual platforms in a blended learning approach (Bates, 2020; Christian et al., 2020). Innovations have thus replaced the traditional face-to-face classroom with virtual platforms such as Moodle, Udemy, Blackboard, and Codecademy (Lapitan et al., 2021; Rafique et al., 2021). Further, many educational systems have leveraged the tutor function to enhance student performance in blended learning environments (Krasnova and Popova, 2016; Hurtado, 2014).

While better student performance has primarily been the concern of higher education institutions within developing countries, research on the specific pedagogical skills that influence students' performance has only sometimes considered the role of technological innovations. This can partly be attributed to the fact that the traditional face-to-face classroom remains the dominant platform for tutor/student interaction within most developing countries, which better suits large traditional classroom scenarios (Alaagib et al., 2019; Miller et al., 2013). In this regard, there needs to be more empirical evidence on tutoring approaches, efficiency, and student performance in the context of new virtual platform developments.

In a tutor-focused approach, the tutor takes a central role, and the student is dependent on the tutor. (Wilson et al., 2019). Accordingly, students in this approach are not expected to be creative, nor have the ability for innovative thinking (Nie and Lau, 2010). Consequently, it has been argued that if a tutor-centred approach is adopted, low student engagement and waning interest will be the result (Sigman, 2020). Contrary to 'tutor-centred approaches', advocates for 'student-centred' approaches, Piaget (1954) and Vygotsky (1986) argue that this approach allows the student to reason logically, developing a deeper understanding of concepts and new knowledge by assimilating the concepts they have learnt. Therefore, assimilation, conceptualisation, and interaction with the social environment are vital features furthering student cognitive development within this 'student-centred' approach (Mohammed and Kinyo, 2019; Vygotsky, 1986).

Niaz (2008) and Alsharif (2014) laud the student-centred approach to learning as it enhances a student's ability to teach critical thinking skills. These theoretical perspectives have been the subject of empirical studies in various contexts. For instance, Rasheed et al. (2020a) assessed the impact of blended learning on student performance while examining the challenges tutors faced in this approach. Their study showed that a blended learning environment did not necessarily contribute positively to student success or tutor performance. This was attributed to students facing self-regulation challenges, such as poor time management and procrastination, while tutors struggled with technological literacy issues (Rasheed et al., 2020a).

Further, Bower et al. (2015) examined the impact of blended synchronous learning on teaching efficiency and student performance among tertiary students in Australia and New Zealand. The findings showed that blended synchronous learning adversely impacted the teaching process because tutors had to teach, operate the technology, and facilitate interaction simultaneously. The study also indicated that there were discernible

delays in transition and audio problems with students in remote areas stemming from poor quality and access to digital networks. Similar findings were observed in studies by Zhu et al. (2016), Yang et al. (2019) and Pinto-Llorente (2017). However, these studies did not outline the specific tutor attributes most valued by students, how they impact their performance, or the relative importance of each factor to overall student performance.

Furthermore, while studies have mainly concentrated on challenges students and tutors face in both face-to-face and online tutoring (see Rasheed et al., 2020b; Youde, 2020; Hurtado, 2014; Peacock et al., 2012), the pedagogical skills and qualities, which are influential to performance, remain under-researched. In addition, although different categories of tutor qualities have been revealed in numerous studies (Kahu and Picton, 2019; Olufemi et al., 2018; Wood and Tanner, 2012; Murphy et al., 2009; Schmidt and Moust, 1995), none of these studies examined how factors such as tutor work ethic, tutor content delivery combined with student and tutor experiences shape overall student learning and development. As such, the extent to which student performance is impacted by aspects such as tutoring, work ethic, personality, and content delivery are issues yet to be fully theorised from an educational context.

Therefore, this study examined students' expectations of tutors' work ethic, personality, and content delivery and how experiences on these aspects shape overall student performance. The study contributes to knowledge by assessing how students experienced different tutor qualities and the perceived impact on their performance in a blended learning environment. In addition, unlike previous studies, the study takes an advanced approach, adopting a neural network methodology to examine the statistical significance of the tutor qualities in predicting students' performance. The study's findings are envisaged to be beneficial in developing strategies to enhance tutors' effectiveness in higher education.

2 Literature review

2.1 Theory of planned behaviour

The theory of planned behaviour (TPB) by Ajzen (1991) explains human behaviour based on three factors: attitude towards behaviour, subjective norms, and perceived behavioural control. According to the theory, the three factors determine the behavioural intention of human beings. Attitude towards behaviour refers to one's evaluation of a particular behaviour and perception of the outcome of that behaviour. Subjective norms are based on the majority's or peers' beliefs and influence expectations to undertake or not to undertake a particular behaviour. On the other hand, perceived behavioural control is one's impression of the ease of doing a specific task.

Literature has linked students' achievement and behaviours. For example, Schmidt and Moust (1995) used a causal model to determine the extent of tutor behaviour on students' achievement and established the significance of the relationship between selected variables through hypothesis tests. Therefore, in line with the TPB, the current study considers how attitude, subjective norms, and perceived behavioural control influence students' intentions in engaging in tutoring sessions.

2.2 Empirical literature review

Research on effective tutoring is broad in scope and borrows from different areas of education, social sciences and psychology (Fischer and Hänze, 2019; Mohammed and Kinyo, 2019; Piaget, 1954; Vygotsky, 1986; Bloom, 1984). The point of intersection between these research studies lies in identifying practical tutoring approaches that lead to better cognitive development and learning outcomes.

Seminal works by Piaget (1954), Vygotsky (1986) and Bloom (1984) advocated for constructivist approaches to the tutor-student engagement process. According to Piaget (1954), the tutor should allow students to reason logically and understand concepts while generating knowledge. Furthermore, Vygotsky (1986) believed that students should be allowed to communicate and interact with their social environment. Such engagement could take the form of an organised peer interaction, where the tutor facilitates the tutorial through a managed discussion by extending the concepts presented within the lecture space into the tutorial environment. The use of technology is a critical feature here, by merging conceptual ideas into real-world case studies. By incorporating technology through a blended learning tutorial approach, the tutor's role can be amplified with the integration of complex issues experienced in the social environment. This creates a practical platform to facilitate a deeper understanding of the topic. Using both online and peer interaction, the tutor is positioned to guide on complex issues, expanding on student development and furthering the cognitive ability to create knowledge.

Bloom (1984), however, goes a step further by investigating methods of group instruction between peers, which is as effective as a one-on-one tutoring approach. Bloom (1984) compared student learning under three scenarios. The first is conventional learning with 30 students per class and one teacher with formative tests, and the second is mastery learning again with 30 students and one teacher and formative tests, followed up by parallel tests for mastery. The third scenario was a tutoring approach with each student learning a subject under the guidance of a tutor with formative tests, feedback, and parallel tests for mastery. The study's findings showed that students under the one-on-one tutoring approach performed better than the conventional mastery classes. The students' test results from the one-on-one tutoring approach were observed to be two standard deviations above those of the conventional class, demonstrating the effectiveness of one-on-one tutoring as a tool for improved student performance. In learning institutions where finding a tutor for each student is practically impossible, this approach may not be feasible, especially within large group settings.

Studies on teaching efficiency identified and developed a taxonomy of tutor qualities that have the same effect as one-on-one tutoring but under large class settings. Different categories of these qualities have been revealed in numerous studies (Kahu and Picton, 2019; Olufemi et al., 2018; Wood and Tanner, 2012; Murphy et al., 2009). Murphy et al. (2009) examined the qualities of effective tutors in the context of distance language teaching and found that students valued personal engagement and also appreciated tutors who demonstrated enthusiasm, offered emotional support and were committed to tutoring, thus providing a learning atmosphere where students could participate and engage more in the learning process. However, Murphy et al. (2009) limited their study to distance learning platforms. Similarly, Wood and Tanner (2012) examined the qualitative characteristics of effective tutors in large classes and developed seven traits identifiable with effective tutors including intelligence, personal rapport, providing no solutions, progressive, indirect, reflective, and encouraging. However, the findings were

based on a study sample comprising primary and secondary school students, and as such, may be inapplicable in the context of higher education.

Studies in the higher education context have shown the favoured tutor traits to be more on the empathetic side but with good knowledge of their subjects; thus, tertiary students may prefer tutors who are helpful, caring, approachable, able to communicate, and are masters of their subjects (Kahu and Picton, 2019; Olufemi et al., 2018). In Shelley et al.'s (2006) opinion, tutor attributes and expertise and learning environments continually change in response to shifts in technology and institutional factors like funding availability and quality control measures.

With educational institutions increasingly leveraging technological innovations and adopting new pedagogical approaches to learning, such as blended learning, there is a need to develop a new taxonomy of tutor characteristics that suits the new techniques. Advocates for blended learning approaches, such as Yang et al. (2019), Pinto-Llorente et al. (2017) and Hubackova et al. (2011), argue that blended learning is convenient for both tutors and students as it allows pre-recorded texts and files, which students can use at their own time while enabling interaction in face-to-face sessions.

Initial studies on tutor qualities for blended learning have primarily been conducted in the context of developed countries (Marie, 2021; Thomas et al., 2017; Krasnova and Popova, 2016; Bower et al., 2015; Taylor and Newton, 2013; He et al., 2011). Further, these studies have tended to focus more on changes and challenges brought to the learning environment through blended learning with a limited contribution on tutor qualities effective for improved student performance in a blended learning environment.

3 Methods

3.1 Research approach

This study investigated tutoring attributes which can influence student performance. A quantitative research approach was applied among university students. This is suitable for correlational studies or tests of *a priori* relations (Martin et al., 2011). Quantitative data on tutor qualities, expectations and experiences, and students' performance were collected using a research questionnaire administered to students on the Google Forms platform. The questionnaire was designed after a literature review to identify predominant tutor practices and student performance factors. In this regard, the questionnaire covered 28 aspects of tutor practices and attributes, categorised into three main components: tutor work ethic, tutor personality, and tutor content delivery. Respondents were required to rank their level of agreement on tutor expectations and experiences of specific tutor practices under the three components using a five-point Likert scale. A Likert scale assumes that the strength/intensity of an attitude is linear, that is, in a continuum from strongly agree to strongly disagree, and assumes that attitudes can be measured (Allen, 2017). Likert scales have the advantage that they do not expect a simple yes or no, but allow for degrees of opinion and even no opinion at all, and can be analysed with relative ease (Allen, 2017; Cui et al., 2020). The responses included a level of agreement scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire also covered student performance aspects including self-planning, self-regulation, and self-evaluation. Students were thus asked to indicate their levels of

agreement on the extent to which aspects relating to their overall performance had been impacted in their learning experience with tutors.

3.2 Data collection

The study sampled students who worked closely with tutors within a business faculty at a university in South Africa. The purposive sampling technique was applied, targeting first and second-year students, while convenience sampling was used based on the availability and willingness to participate in the study. According to Obilor (2023), convenience sampling can be used when the target population is easily accessible, while purposive sampling technique is used to focus on special behaviours, personalities or attributes. One hundred and fourteen students from nine academic fields responded to the questionnaire issued for six weeks towards the middle of the second semester in 2021. The period provided sufficient time for the sample group to have experienced the benefits of the tutorial process. These were split between first and second years, with first years making up 96 respondents, while 18 were sampled from second-year students. The sample covered a spectrum of tutorial experience and courses to provide a comprehensive examination of the tutoring approaches and attributes.

3.3 Data analysis

The initial part of the analysis involved measuring the reliability of the questionnaire using Cronbach's (1951) alpha. This was followed by extracting a group of descriptive statistics, including the mean, mode, median, and standard deviation of the respective research questions, to familiarise with the data by demonstrating the extent of central tendency and dispersion of the questionnaire responses. The most preferred response was depicted through the mode, while the mean was used to show the extent to which data grouped around a specific response. The distribution of responses was measured through the standard deviation. Standard deviation values greater than the mean suggest high response variability, while lower values indicate lower variability.

The relationship between students' experienced tutor approaches and student's performance was analysed using a correlation analysis. Schmidt and Moust (1995) opined that a correlation analysis be used to assess the strength of the linear relationship between the tutor approaches and students' performance. However, the correlation measurement cannot predict the importance of specific tutor attributes to student performance. To predict the significance of each tutor attribute in determining student performance, an artificial neural network (ANN) was used.

The ANN is a methodology that simulates the human brain to solve complex research problems and is a valuable tool for identifying relationships between variables and predicting future values (Baashar et al., 2022). It has been applied in studies of a similar nature by Livieris et al. (2012), Naser et al. (2015) and Baashar et al. (2022). ANNs are developed using layers of nodes consisting of an input layer, additional hidden layers, and an output layer (Bhargavi, 2021). Every node connects to another node and is allocated weighting and threshold values (Baashar et al., 2022). When the output of any individual node is above the specified threshold value, that node is stimulated and responds by sending the data to the next layer. The interconnecting lines show the network's synaptic weights, with the connection's strength depicted by the width of the

lines (López et al., 2022). The greater the width of the lines, the stronger the correlations between variables.

4 Results and discussion

This section presents the results of the descriptive and inferential analyses undertaken on the students' expectations, experiences, and student's perceptions of the impact of tutoring on their performance.

Table 1 Demographic distribution of students

	Frequency	*Percent*	*Valid percent*	*Cumulative percent*
Gender				
Male	43	37.7	37.7	37.7
Female	71	62.3	62.3	100
Total	114	100	100	
Field of study				
Marketing	1	0.9	0.9	0.9
Economics	16	14.0	14.0	14.9
Human resources	7	6.1	6.1	21.1
Finance	14	12.3	12.3	33.3
Accounting	26	22.8	22.8	56.1
Public management	13	11.4	11.4	67.5
Applied information systems	4	3.5	3.5	71.1
Business management	1	0.9	0.9	71.9
Other	32	28.1	28.1	100.0
Total	114	100.0	100.0	
Level of study				
First year	96	84.2	84.2	84.2
Second year	18	15.8	15.8	100
Total	114	100	100	

4.1 Demographic profile of respondents

Table 1 shows the demographic breakdown of respondents by age, academic field, and level of study. The distribution by gender had female respondents taking up 62.3% while the males comprised 37.7% of respondents. Distribution of students surveyed by academic field within the study showed most respondents (28.1%) were from other fields (non-economic and management sciences) while 22.8% were from accounting, 14% from economics, 12.3% from finance, 11.4% from public management and 6.1% were from the human resources management field. The marketing and management fields had the least respondents, with each taking up 0.9% of the share of student respondents. The wider distribution in terms of fields of study allowed for diversity in student opinion on the subject matter. Most respondents (84.2%) were first-year students, while the

remaining (15.8%) were second-year students. Having most of the student respondents in their first year is significant because literature has shown that first-year student support and quality of teaching are related to student achievement and retention (Kahu and Picton, 2019; Larkin et al., 2016).

4.2 Reliability of the research instrument

The internal consistency of the questionnaire was measured using Cronbach's (1951) alpha. Cronbach's alpha determines the extent to which Likert scale questions reliably measure a latent variable. Findings (Table 2) showed all five components had Cronbach alpha coefficients above 0.90, confirming the high reliability of the survey questionnaire. The higher the alpha coefficient, the greater the reliability of the questionnaire. Therefore, values ranging between 0.6 and 0.7 are acceptable, while 0.8 and above are very good (Cronbach, 1951).

Table 2 Reliability of the research instrument

Component	*N*	*Cronbach's alpha*
Student expectation	28	0.990
Student experiences	28	0.993
Self-planning	14	0.930
Self-regulation	11	0.937
Self-evaluation	7	0.929

4.3 Descriptive analysis results

4.3.1 Students' expectations of tutors

Table 3 highlights descriptive statistics from the sample response group on responses to their expectations of tutors. The responses were categorised into three categories, namely, 'expectation on tutor work ethic', 'tutor personality' and 'content delivery' by the tutor. Responses to each category were ranked according to mean in descending order.

Under the 'work ethic' category, students ranked the need for tutors to be well-prepared for tutorials as the most important factor, with a mean of 4.18. The mode and median score of 5 on this factor confirmed that most respondents strongly agreed that they expected tutors to be well prepared. The second highest ranked factor in the 'work ethic' category was the need for tutors to give clear information about an expected approach (mean = 4.17), followed by the expectation that tutors will give information to do work in time (mean = 4.14). For both factors, modal and median values of 5 showed that most respondents strongly agreed with these opinions.

Other factors for which students had high expectations of tutor work ethic included the need to encourage teamwork and interaction between students (mean = 4.03), the expectation to give constructive feedback after assignments (mean = 3.99), the expectation to give guidance when the student is on the right track or stuck (mean = 3.99) and the use of technology for instruction and communication (mean = 3.95). Students were, however, not too keen on having tutors assisting them with their assignments (mean = 3.61) and tutors offering extra lessons (mean = 3.61). These findings reinforce the need for tutors to be adequately organised, give constructive feedback, and be

competent in terms of technological skills as observed by Kahu and Picton (2019), Krasnova and Popova (2016) and Murphy et al. (2009).

Regarding 'tutor personality', the students indicated that they expected tutors to treat and help students equally (4.20), be helpful, and give clarity when they ask questions (mean = 4.17). Other tutor personality traits which scored highly on expectations included the need for tutors to be friendly and approachable (mean = 4.11), tutors to interact well with students (mean = 4.10) and to be willing to assist with content students are struggling with (4.01). Modal and median values of 5 throughout the personality traits showed that students strongly agreed on these tutor personality expectations.

Table 3 Descriptive statistics of students expectations of tutors

	N	*Mode*	*Mean*	*Median*	*Std. dev.*
Work ethic of tutor					
Prepare well for tutorial sessions	114	5	4.1842	5	1.23780
Give clear information about expected approach	114	5	4.1667	5	1.28240
Give information in time to do work/task	114	5	4.1404	5	1.26825
Encourage teamwork and interaction between students	114	5	4.0263	4.5	1.27925
Give constructive feedback after assignment	114	5	3.9912	4	1.22291
Give guidance when I am on the right or when am stuck	114	5	3.9912	4	1.28639
Use technology for instruction and communication	114	5	3.9474	4	1.31595
Encourage goal setting	114	5	3.9123	4	1.30052
Tutor should use small groups/classes	114	5	3.8772	4	1.31122
Explain assignments before tests	114	5	3.8684	4	1.30019
Give direction on how to use tech for work and communication	114	5	3.8596	4	1.32289
Consider student expectations to personalised learning experience	114	5	3.8333	4	1.18931
Tutor should use one on one consultations	114	5	3.8246	4	1.19175
Assist me with my assignments	114	5	3.6053	4	1.25943
Give extra classes to assist with transition to online learning	114	5	3.6053	4	1.29409
Personality of tutor					
Treat and help students equally (unbiased)	114	5	4.2018	5	1.29792
Be helpful and give clarity when I ask questions	114	5	4.1667	5	1.30294
Be friendly and approachable	114	5	4.1053	5	1.29921
Interact well with students	114	5	4.0965	5	1.28964
Be willing to assist on content I am struggling with	114	5	4.0263	5	1.30662
Be available for individual or small group consultation	114	5	3.9035	4	1.26189

Table 3 Descriptive statistics of students expectations of tutors (continued)

	N	*Mode*	*Mean*	*Median*	*Std. dev.*
Content delivery by tutor					
Presents content in a logical and organised manner	114	5	4.0614	5	1.29181
Provide content related to lectures	114	5	4.0526	5	1.28188
Simplify the content to be understandable	114	5	4.0175	4	1.28285
Present content in line with future needs	114	5	4.0000	4	1.26910
Generates learning ideas from interactions with students	114	5	4.0000	4	1.26910
Provide content that assists with assignments	114	5	3.9912	4	1.27255
Provide content which links with past material	114	5	3.8333	4	1.26852
Valid N (listwise)	114				

Murphy et al. (2009) agreed that tutors with greater empathy and understanding of the student's life experiences tend to be more efficient in facilitating the learning process. Expectations on content delivery show that students were interested in tutors who present content in a logical and organised manner (mean = 4.06), content related to lectures (mean = 4.05) and simplify the content to be understandable (mean = 4.02). Therefore, in addition to the identified work ethic and personality traits, students expect tutors to deliver content that optimally matches their understanding levels. This finding aligns with observations by Chi et al. (2004) that tutors need to accurately monitor students' understanding.

Further, respondents were of the opinion that the content delivered should be in line with future needs (mean = 4.00) and be able to generate learning ideas from interaction with students. The content expectations identified in the current study align with some aspects of the inspire model proposed by Wood and Tanner (2012), such as the intelligence aspect, which suggests tutors must have the appropriate content for their teaching level.

4.3.2 Students' experiences

Table 4 shows descriptive statistics on students' experiences with tutors. Responses were categorised according to experiences on tutor work ethic, tutor personality and content delivery. In terms of tutor work ethic, students were largely in agreement that tutors gave information in time to carry out tasks or work (mean = 4.07), provided clear information about expected approaches (mean = 4.04), and prepared well for lectures (mean = 4.02).

Other tutor work ethic factors to which students were highly agreeable and fell within the mean score of 4 included giving guidance to students (mean = 4.02) and using technology for instruction and communication (mean = 4.00). Students also valued tutors' encouragement, fostering teamwork, and deepening tutor/student interaction (mean = 3.90). Goal setting in the tutorial also received a high score (mean = 3.90). Modal values of 5 indicate that most students selected the strongly agreed option on all the factors, while the standard deviation values were well below the mean scores, showing low variation in responses.

Table 4 Descriptive statistics on students' experiences

	N	*Mode*	*Mean*	*Median*	*Std. dev.*
Experiences in tutor work ethic					
Give information in time to do work/task	114	5	4.0702	4.5	1.23173
Give clear information about expected approach	114	5	4.0439	4.5	1.25077
Prepare well for tutorial sessions	114	5	4.0263	4	1.24418
Give guidance when I am on the right or when am stuck	114	5	4.0263	4	1.25127
Use technology for instruction and communication	114	5	4.0000	4	1.25508
Encourage teamwork and interaction between students	114	5	3.9561	4	1.31963
Give constructive feedback after assignments	114	5	3.9298	4	1.32183
Encourage goal setting	114	5	3.9298	4	1.28792
Give direction on how to use tech for work and communication	114	5	3.8684	4	1.32714
Explain assignments before tests	114	5	3.8070	4	1.29586
Consider student expectations to personalised learning experience	114	5	3.7632	4	1.30555
Tutor should use small groups/classes	114	5	3.7018	4	1.34973
Give extra classes to assist with transition to online learning	114	5	3.6754	4	1.36645
Tutor should use one on one consultations	114	5	3.6404	4	1.34446
Assist me with my assignments	114	5	3.5965	4	1.32851
Experiences on tutor personality					
Treat and help students equally (unbiased)	114	5	4.0965	5	1.31680
Interact well with students	114	5	4.0789	5	1.28397
Be helpful and give clarity when I ask questions	114	5	4.0614	5	1.33890
Be friendly and approachable	114	5	4.0263	5	1.33344
Be willing to assist on content I am struggling with	114	5	4.0088	4	1.29325
Be available for individual or small group consultation	114	5	3.8684	4	1.32045
Experiences on tutor content delivery					
Provide content related to lectures	114	5	4.0877	5	1.26604
Presents content in a logical and organised manner	114	5	4.0351	5	1.30302
Simplify the content to be understandable	114	5	3.9912	4	1.30007
Provide content that assists with assignments	114	5	3.9825	4.5	1.33026
Present content in line with future needs	114	5	3.9123	4	1.30052
Generates learning ideas from interactions with students	114	5	3.9035	4	1.35653
Provide content which links with past material	114	5	3.8421	4	1.30064
Valid N (listwise)	114				

The research findings concur with observations by Shelley et al. (2006), Murphy et al. (2009) and Wood and Tanner (2012) on the qualities of a good tutor. Findings indicated that students were less appreciative of tutors' efforts on certain work ethics aspects, such as the use of one-on-one consultations, assisting with assignments, and giving extra classes to assist with transition to online learning had lower mean scores of 3.64, 3.59 and 3.67 respectively. The findings support the perspective by Fraser and Hasan (2019) that a supportive learning environment with one-on-one learning is considered beneficial to students.

Students' experiences of tutor personality were largely positive, as reflected by mean scores ranging between 4.09 and 4.00 for factors such as treating and helping students equally, interacting well with students, and being friendly and approachable, amongst others. In terms of content delivery, students also agreed that tutors provided content related to lectures (mean = 4.08), presented content in an organised manner (mean = 4.03), simplified content to be understandable (mean = 3.99), and provided content that assisted students in assignments (mean = 3.98). Modal values of 5 on all the factors confirm that most students strongly agreed on these aspects.

4.3.3 Student performance

Table 5 depicts findings on students' performance post-tutoring. Students' performance was split into three categories: self-planning, self-regulation, and self-evaluation. In terms of self-planning, respondent students agreed that tutoring had positively impacted their ability to understand the content better (mean = 4.19), recognise priorities and set personal targets (mean = 4.19), and complete tasks independently (mean = 4.09). Similar positive contributions from tutoring were also observed in terms of the student's ability to do all work and submit as required (mean = 4.05), complete tasks as planned (mean = 4.02), and ability to understand concepts and take notes (mean = 3.96). Modal and median values of 4 indicate that most students agreed that tutoring approaches had been beneficial to them in the aspects mentioned above. The findings support the view that tutor-guided methods improve students' cognitive abilities and interests in learning (Fischer and Hänze, 2019).

From this analysis, low average scores were obtained on other self-planning factors such as gathering more information to understand the work better (mean = 3.68), ability to handle the pressure of online learning (mean = 3.66), ability to handle general academic pressure (mean = 3.42), ability to work well with other students on assignments (mean = 3.30) and regularly attending lectures (3.12). Median values of 3 on some of these aspects indicate that at least 50% of students were neutral, disagreed, or strongly disagreed that their self-planning had been positively impacted through tutoring experiences. Such findings lend credence to the view that students can sometimes be overwhelmed by the pressures of online learning as the content and technological requirements may be too much (Taylor and Newton, 2013). Study findings also showed that tutor guidance improved students' self-regulation.

Mean scores above 4 indicated students' agreement on awareness of what they learned (mean = 4.19), searching for links between topics and modules (mean = 4.06), overcoming difficulties of their work (mean = 4.05), completing tasks with much accuracy (mean = 4.03) and ability to apply knowledge to practical situations (mean = 4.02). The modal values of 4 suggest most respondents agreed with improvements in self-regulation, while median values indicated at least 50% of

respondents had agree or strongly agree as their response. The low standard deviation values of less than one indicate that responses were clustered around the mean scores, and there was little variation in responses. The findings align with He et al. (2011), who associated better self-regulation with better student guidance.

However, the findings on self-regulation again showed that students were failing to cope with the pressures of higher education, as reflected by their inability to cope well with assessments (mean = 3.63). Students were also observed to be better able to self-evaluate their progress and ways of improving (mean = 4.06), learning new things and having a broader knowledge of the subject (mean = 4.05), remaining focused and working hard to achieve targets (mean = 4.02) and mark improvement (4.02). Findings on other aspects of self-evaluation including confidence in academic abilities, maintaining performance during online learning, and obtaining results approximate to the expected, had low mean values of 3.72, 3.49, and 3.44, respectively, suggesting students did not consider themselves improved in these aspects. The inability to maintain performance during online learning aligns with findings by Wanner and Palmer (2015) that students prefer a clear structure for optimum performance in blended learning and not just online learning.

Table 5 Descriptive statistics on student performance

	N	*Mode*	*Mean*	*Median*	*Std. dev.*
Self-planning					
I understand the content better	114	5	4.1930	4	0.77434
I recognise my priorities and set targets for myself	114	4	4.1930	4	0.73926
I can complete a task independently because I know what is required of me	114	4	4.0965	4	0.66478
I do all my work and submit as required	114	4	4.0526	4	0.66309
I can complete a task as planned	114	4	4.0263	4	0.67129
I am able to take notes because I understand the concepts better	114	4	3.9649	4	0.22772
I prepare better for assessments and exams	114	4	3.8158	4	0.43244
I spend more time on my subjects to read the notes from tutorials	114	4	3.7982	4	0.42447
I manage my time wisely and plan work effectively	114	4	3.7719	4	0.49841
I gather additional information by myself to understand the work better	114	3	3.6842	3	0.82350
I am able to handle the pressure with online learning	114	4	3.6667	4	1.0014
I am able to handle general academic pressure	114	4	3.4211	4	0.79706
I work well with my fellow students on group assignments	114	4	3.3070	3	0.76572
I do not miss/skip tutorials	114	4	3.1228	3	1.0487

Table 5 Descriptive statistics on student performance (continued)

	N	*Mode*	*Mean*	*Median*	*Std. dev.*
Self-regulation					
I have become aware of what I learned and how I learned it	114	4	4.1930	4	0.73926
I can search for links between topics and modules	114	4	4.0614	4	0.62803
I try with much effort to overcome the difficulties and errors on my work	114	4	4.0526	4	0.63583
I complete tasks or assignments with much accuracy	114	4	4.0351	4	0.60864
I can apply knowledge to practical situations	114	4	4.0263	4	0.64438
I can apply knowledge to other situations and modules	114	4	3.9825	4	0.18732
I can identify difficulties as they appear	114	4	3.8421	4	0.38967
I can search for links between topics and modules	114	4	3.8421	4	0.74761
I can summarise concepts in my own words	114	4	3.8333	4	0.98589
I know when I need to consult	114	4	3.7193	4	1.0088
I cope well with assessments (happy and motivated; not stressed or anxious)	114	4	3.6316	4	0.50244
Self-evaluation					
I have become aware of my progress and what I can do to improve	114	4	4.0614	4	0.62803
I have learned new things and have broader knowledge of the subject	114	4	4.0526	4	0.66309
I remain focused and work hard towards achieving my set targets	114	4	4.0263	4	0.64438
My marks show that I improved during online learning	114	4	4.0263	4	1.0429
I am positive and confident in my academic abilities	114	4	3.7281	4	0.99810
My marks show that I maintained my performance during online learning	114	3	3.4912	3	0.99775
My obtained results are approximate to the expected ones	114	4	3.4474	4	0.82109
Valid N (listwise)	114				

4.4 Correlation analysis results

Table 6 shows correlation coefficients for all the variables. Tutor work ethic was observed to have strong positive linear associations with tutor personality (0.907) and tutor content delivery (0.886). Therefore, the tutor's work ethic may impact their personality and effectiveness in delivering teaching content. This finding supports Schmidt and Moust's (1995) view that tutor skills are interconnected and interact with

each other to influence students' performance. Weak negative associations were noted between tutor work ethic and student performance measures such as self-planning, self-regulation, and self-evaluation.

According to Chih-Hao (2019), time spent by students on their own may have a greater influence on student performance than time spent with tutors, suggesting tutor work ethic may not necessarily be aligned with improved students' performance. On the other hand, tutor personality and content delivery had weak but positive associations with all the student performance measures. This suggests that the contributions from tutoring may be marginal but positive. Therefore, in the end, students may benefit from the marginal but cumulative gains from tutor guidance. Self-planning had strong and positive correlations with self-regulation (0.965), self-evaluation (0.942), and the overall performance measure comprising all three (0.986), while at the same time, self-regulation and self-evaluation had a positive coefficient of 0.957. The plausible explanation for the high positive correlations is that the performance measures are also interconnected with improvements in performance for one measure having an impact on other measures. Fischer and Hanze (2019) attribute this to the cumulative impact of tutor-guided methods where the impact is threefold: improvement in cognitive ability, increased interest in learning, and improvement in academic performance.

Table 6 Correlation analysis

	Work ethic	*Personality*	*Content delivery*	*Self-planning*	*Self-regulation*	*Self-evaluation*	*Overall performance*
Work ethic	1	0.907***	0.886***	0.015	–0.012	–0.004	–0.002
Personality	0.907***	1	0.871***	0.093	0.059	0.067	0.071
Content delivery	0.886***	0.871***	1	0.043	0.003	0.001	0.013
Self-planning	0.015	0.093	0.043	1	0.965***	0.942***	0.986***
Self-regulation	–0.012	0.059	0.003	0.965***	1	0.957***	0.985***
Self-evaluation	–0.004	0.067	0.001	0.942***	0.957***	1	0.967***
Performance	–0.002	0.071	0.013	0.986***	0.985***	0.967***	1

Note: ***/**/* denotes significance at 1%, 5% and 10% respectively.

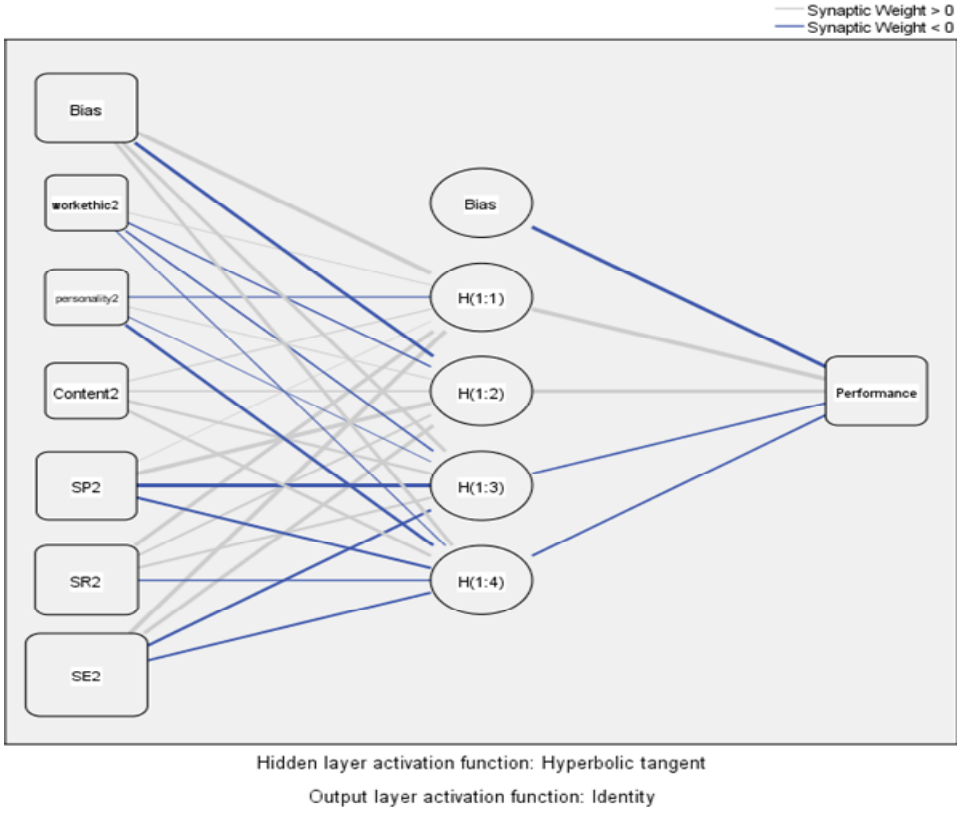
4.5 ANN results

Following the correlation analysis, ANN was used to reveal the statistical importance of each specific factor (tutor qualities and student experiences) on overall student performance or their predictive capabilities of future performance. Figure 1 depicts the ANN for student performance as predicted through the model. The input layer to the left shows the independent variables, while the hidden layer in the middle shows the nodes connecting the independent variables to the output, which is referred to as the student's performance. The interconnecting lines show the network's synaptic weights, with the connection's strength depicted by the width of the lines. The depicted network shows the strength of the relationship between tutor personality, self-planning, self-regulation, self-

evaluation, and student performance. The wider lines indicate stronger correlations between the variables.

Furthermore, the relative importance of each factor is shown in Table 7, the model summary of the ANN results. A total of 81 samples were used in training the model, and the remaining 33 were used in testing. During training, the model sought to improve its accuracy by reproducing known results while in testing, the model's predictive capabilities were examined and checked for errors (Baashar et al., 2022). The training results had a sum of the square values of 0.430 and a relative error of 0.11, while the tested dataset had a relative error of 0.004, implying the model had an accuracy of 99% for both training and testing, which is a strong predictive capability. The model estimated the importance of each of the independent variables in relation to overall student performance. The findings showed tutor qualities were not essential determinants or predictors of student performance. Tutor work ethic was observed to have a normalised importance of 2.1%, while that for tutor personality was 4.3%. Tutor content delivery has a normalised importance of 2.9%. These findings contradict the long-held views that there are specific tutor attributes which contribute significantly to student performance (Kahu and Picton, 2019; Murphy et al., 2009; Wood and Tanner, 2012). This is probably due to the range of respondents included in the study across different subjects and academic disciplines.

Figure 1 ANN for student performance (see online version for colours)



In concurrence with He et al. (2011) and Alaagib et al. (2019), ANN results support self-directed learning instead of tutor-guided approaches. Findings showed cognitive performance actions such as self-planning, self-regulation, and self-evaluation were very important predictors of overall student performance. Self-planning had a normalised importance of 46% relative to student performance, while estimates for self-regulation and self-evaluation were 53% and 100%, respectively. In support of this finding, He et al. (2011) note that students tend to perform better, be more responsible, and have the ability to assess their performance when they are allowed to be more independent. The predicted model produced an R^2 value of 0.989 against actual student performance, indicating that 98% of the variation is explained through the model. This could imply that the value of the network model is a good description of the tutoring experience.

Table 7 ANN model table summary

Training sum of squares error	0.430	
Relative error	0.011	
Testing sum of squares error	0.067	
Relative error	0.004	
	Importance	*Normalised importance*
Tutor work ethic	0.010	2.1%
Tutor personality	0.021	4.3%
Tutor content delivery	0.014	2.9%
Self-planning	0.223	46.5%
Self-regulation	0.255	53.3%
Self-evaluation	0.478	100.0%

When contextualised to the TPB by Ajzen (1991), in terms of attitude, the findings show that students have high expectations of their tutors regarding work ethic, personality, and content delivery. Such positive attitudes show that students perceive engaging with tutors as crucial to their learning development and performance. The findings also show that students value tutors who create a supportive and engaging environment. This is in line with subjective norms in that students are likely to be influenced by peers and other academic community members about the importance of engaging with tutors. When students see that getting help from tutors is normative behaviour, they are more likely to engage in it. The findings also show that students perceive to be more in control of their learning and ability to engage with tutors when they are provided with clear information and guidance and when technology is used during tutoring effectively. These findings concur with Yam (2010) and Okoro and Phiri (2023). In that regard, when students have positive intentions toward using tutors based on their attitudes, subjective norms, and perceived behavioural control, they are more likely to seek assistance from tutors.

5 Conclusions

This research paper focused on the role of tutor attributes in predicting performance of higher education students. The study aimed to shed light on the impact of tutor work ethic, personality, and content delivery on students and understand how these factors

contribute to students' self-planning, self-regulation, and self-evaluation, ultimately affecting their overall performance. The demographic profile of the respondents revealed a diverse group of students, predominantly first-year students, representing various academic fields. An ANN was used to complement the correlation analysis findings and examine the importance of specific tutor qualities and student experiences on overall student performance. The study revealed that students have high expectations of their tutors, particularly in terms of tutor work ethic and personality. They value tutors who are well-prepared, approachable, and provide clear guidance. In the context of the TPB, these positive attitudes show that students perceive engaging with tutors as crucial to their learning development and performance.

Furthermore, students expect tutors to use technology effectively for instruction and communication. These expectations align with the existing literature on effective tutoring. On the other hand, tutor qualities, especially in terms of work ethic and personality, positively influence students' experiences. From the study, tutors who exhibit these qualities create an environment where students feel supported, engaged, and motivated. Accordingly, from TPB, when students see that getting support from tutors is normative behaviour, they are more likely to engage in it.

Further, when students have positive intentions toward using tutors based on their attitudes, subjective norms, and perceived behavioural control, they are more likely to seek assistance from tutors. This positive impact on student experiences reflects the importance of tutors in shaping the learning environment. The study also revealed that student performance is closely linked to their ability to self-plan, self-regulate, and self-evaluate. Students who reported improvements in these areas tended to perform better academically. This finding underscores the significance of fostering self-directed learning skills among students. However, the study's ANN analysis did not identify tutor qualities (work ethic, personality, and content delivery) as significant predictors of overall student performance. Instead, the ANN results emphasised the critical role of self-directed learning skills, with self-regulation and self-evaluation being the strongest predictors. The results suggest that while tutor qualities are important for creating a positive learning environment, students' ability to take charge of their own learning through self-planning, self-regulation, and self-evaluation is a more critical factor in determining their academic success.

The study makes several contributions for academic programs. The study provides insight into students' expectations of tutors and assists institutions in recognising the tutor qualities which contribute positively to students learning and development. Through findings on self-directed learning, the study contributes to the discussion on the importance of student autonomy in academic performance. The study recommends the enhancement of programs that focus on key areas identified by students, including work ethic, positive personal traits, and impactful content delivery. Further, academic programs should foster self-directed learning skills among students and promote the idea that tutor engagement is a normative behaviour.

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