

Personal factors associated with satisfaction with tutoring in engineering students

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Abstract

The tutoring of university students is very relevant for the achievement of engineering learning and personal factors are associated with satisfaction, establishing that the knowledge of these factors makes it possible to take measures that contribute to improve tutoring actions. The objective of the research was to establish the association of personal factors to satisfaction with tutoring in engineering students. A quantitative approach was chosen, the design was non-experimental and the association of personal factors with satisfaction with university tutoring. The population consisted of 800 engineering students and by means of probabilistic sampling with a 3% margin of error, the sample consisted of 458 students. The results showed that satisfaction with the university tutor is associated with the factors sex, age and college of origin, obtaining the Chi-square value $\chi^2 = 189.618a, 157.728a$ and $118.106a$ ($p < 0.05$); satisfaction with the university tutor associated with factors of sex, age and school of origin, obtained a Chi-square $\chi^2 = 189.618a, 157.728a$ and $118.106a$ ($p < 0.05$) and satisfaction with the organization and contents of the tutoring was associated with factors of sex, age and school of origin obtained a Chi-square $\chi^2 = 8.876a, 23.189a$ and $17.327a$ ($p < 0.05$). It is concluded that personal conditions are associated with satisfaction with tutoring, with the university tutor and with the organization and contents of tutoring in engineering students.

Key words: Satisfaction with tutoring, university tutor, organization, tutoring contents, personal factors.

1. Introduction

The world is going through a time of crisis and inevitably, there have been serious impacts on education systems around the world. Schools and universities have been closed and millions of children, adolescents and young adults have been out of schools and universities. In such a context, students reported problems related to lack of tutor support and that they experienced technical difficulties in all groups; although engineering students seem to report high motivation and high expectations, many students may fail the course. On the other hand, in recent years, there has been renewed interest in personal tutoring in the UK higher education sector, and many HEIs are reconsidering and improving their personal tutoring provision [1]. Personal tutoring is seen as an important support mechanism for students in higher education [2]. However, the existing personal tutoring system, reported a British University, has for quite some time been in need of review and improvement, as evidence suggests that it is ineffective [3, 4]. The findings raise implications for the formulation of institutional policies for conducting university tutoring and e-learning to improve student experiences [5]; an aspect that is supported by the numerous studies that have shown the effectiveness of tutors on students [6].

The need to support increasingly diverse students has emphasized the personalized learning experience as an expectation of students and an obligation of institutions. This has led universities to review their individualized student support, which in institutions where a personal tutoring system is in place means tutoring arrangements, not only in terms of structure and model, but also fitness for purpose and rigor [7].

Nowadays, university tutoring is of great importance and universities are concerned about the knowledge of the perception of university students in relation to satisfaction with university tutoring [8]. It should be taken into account that decisions to choose and persist in a career or to change career, job or organization are made from adolescence to middle age and are influenced by a number of personal factors [9]. Likewise, at a comprehensive university in Western Europe, university students perceived interactions outside the classroom as important opportunities to develop and refine a wide range of personal knowledge and skills important for becoming internationally competent global citizens and professionals [10].

Good tutoring requires adequate interpersonal and pedagogical skills, so it is recommended that tutors recognize the emotional state of students and adapt learning processes [11]. In addition to developing a better understanding of students on how to use tutor support [12]; since personal tutoring contributes in creating an environment that supports and facilitates student resilience [13]. Being important to assess the dimensions of tutoring satisfaction, such as: satisfaction with the tutor and satisfaction with the organization and content of tutoring [14]. An implementation of adequate tutoring support achieves a significant increase in the perception of tutoring satisfaction [15].

There are a number of factors that impact the personal tutoring system: lack of student awareness of the system and the role of the personal tutor, lack of contact and meetings between the two parties, acceptance of the tutors, qualities of the tutors, and the time needed to disseminate information about the system to the tutors. It is recommended that the existing personal tutoring system be replaced by a personal tutoring unit within each faculty and that the university establish a central support system for students with learning disabilities and also a counseling service [3].

The age factor of students has effects on mentoring in aspects of empathy, altruism and self-esteem of students. Tutoring conducted between students of the same ages may have some psychological benefits in addition to its already established influence on academic achievement [16]. The tutoring method that considers activities between older students with younger student is more effective than those between students of the same age and promotes students' responsibility, empowerment, and academic achievement [17, 18]. On the other hand, students perceived that the peer tutoring program provided them with opportunities that were not otherwise available within the curriculum [19, 20]. The main conclusion of this study is that reciprocal and peer tutoring can be very beneficial [21].

2. Method and analysis

The present study was conducted taking into account the positivist paradigm, seeking the origins of the phenomena in a social environment and holistically formulating the procedure for the observation of reality [22]. The research approach was quantitative, due to the treatment of phenomena in a quantifiable manner [23]. The research design was non-experimental and of association of personal factors with satisfaction with university tutoring [24]. The population consisted of 800 engineering students and by means of probability sampling at 3% margin of error, a sample of 458 engineering students was established. A tutoring satisfaction instrument was applied using the electronic Google Form.

3. Results and discussion

In times of crisis it is important to take into account the flexibility of online tutoring is a variable that influences student satisfaction. Students' evaluations of the importance of specific achievement reflect their mastery goals and their desire to become proficient in an area. Course structure, flexibility of online tutoring and quality of technology are factors that affect student satisfaction [25]. While the quality of the online tutorial is a factor that does not affect student satisfaction, this suggests that the institution should pay more attention to the quality of online tutoring, especially in terms of quality, appearance, ease of use, and interaction between tutors and students. Improvements in such factors related to the quality of online tutoring are expected to improve student learning outcomes. Students' participation in online tutoring can also help them improve the quality of their learning to achieve the expected competencies [26].

There are many strategies to develop tutoring, such as: online tutoring, tutoring using problem-based learning methodology, among others; and in this sense the level of adaptation of problem-based learning by tutors and their expertise in the content were commonly mentioned as factors that affect their performance during problem-based learning implementations [27]. Likewise, the personalized learning environment based on the Intuitel approach includes an Intelligent Tutoring System that provides students with recommendations and feedback on what is the best learning path for them according to their profile, learning progress, context, and environmental influences. This program combines efficient pedagogy-based recommendations with freedom of choice and introduces this tutoring support into different learning management systems. During the project, several software and pedagogical testing procedures were defined to provide feedback to the development teams, both summative and formative. Information is obtained on how students perceive the influence and usefulness of the tutoring system in online learning courses. The results showed that students follow learning paths that are more suitable for them. In addition, the overall satisfaction level of the participants was high. Most students appreciate the program, would follow its recommendations, and would consider the messages displayed by the program as helpful and supportive [28].

Another experience involved a peer tutoring program on academic performance among first-year university students. With an intervention of 20 highly structured individual weekly tutorials given by students, previously trained in three training sessions. The results showed moderate effect sizes and statistically significant differences in favor of the experimental group in the total academic year, as well as in the fall and spring semesters [29]. In fact, since tutoring programs are successful for students, many institutions have allocated significant resources to new student adjustment programs [30]. Such programs basically focus on assisting and supporting new students, facilitating their integration into the new social and academic environment and incorporating different mentoring activities and resources

Two typologies of university tutors that prioritize the academic and personal aspects of tutoring, respectively, become visible. Both profiles are associated with certain types of functions that respond to the needs presented by students throughout their time at the university and support the thesis that university tutoring is moving towards an integral model in which the personal dimension is especially relevant [31]. Therefore, the present study presented as an objective to establish the association of personal factors associated with satisfaction with tutoring in engineering students and the following results were obtained.

Table 1. Personal factors associated with satisfaction with tutoring in engineering students

Variables	Pearson's Chi-square	Asymptotic significance (bilateral)
Sex	103,019 ^a	,000
Age	79,639 ^a	,000
College of provenance	41,580 ^a	,000

In Table 1, it was found that, satisfaction with tutoring is associated with the factors sex, age and college of origin, obtained a Chi-square $\chi^2 = 103.019^a$, 79.639^a and 41.580^a respectively ($p < .05$) so it is established that personal conditions are associated with satisfaction with tutoring in engineering students. Personal factors affect the perception of tutoring satisfaction, because tutoring conducted among students of the same ages may have some psychological benefits in addition to its already established influence on students' academic achievements [16]; knowing that personal tutoring is considered an important support mechanism for higher education students. However, the existing personal tutoring system has for quite some time been in need of review and

improvement, as evidence suggests that it is ineffective [3, 4]. Likewise, considering students of the same age in tutoring activities guarantees opportunities not offered by other types of tutoring that were otherwise unavailable within the curriculum [19, 20], concluding that reciprocal and same-age tutoring can be very beneficial [21].

Regarding tutor-related personal factors in engineering students, it was found that, for teaching engineering in a computer-based instructional module, students preferred a lively engineering tutor who was similar to their age, matched their own gender, had a fun personality, and spoke slowly. This is consistent with the significant association of personal factors with tutoring satisfaction of engineering students in the present study [32].

On the other hand, it is important to consider conducting tutoring activities considering groups of older students with younger students, since it was found that the tutoring method considering activities between older students with younger students was more effective than those between students of the same age and promote responsibility, empowerment and academic performance of students [17, 18, 34]. Developing responsibility, empowerment, and achieving good levels of academic performance was necessary for the development of engineering students' competencies. Peer tutoring is one of the most widespread ways to support the adaptation of new students and can be defined as the acquisition of knowledge and skills through active help and support among peers of equal or compatible status, where both tutors and mentors benefit from the transaction [33].

In relation to effectiveness and outcomes, it was suggested that when peer tutoring is implemented with consideration as to which organizational form best suits the purpose, context, and target population, and with reasonably high implementation integrity, the results are usually very good [34].

It is important to specify that the tutoring environment and the financial independence of students have a positive relationship with the level of satisfaction with a tutor. Disadvantageous factors of tutoring such as loss of productive time, hindering academic results, and lack of recreation reduce the level of satisfaction. Tutors are thought to be self-focused as the outcome and improvement of the tutored are absent from the formulation of their satisfaction; therefore, closing a gap in the feeling of companionship between tutors and students will improve the quality of education [35].

Table 2. Personal factors associated with satisfaction with the university tutor in engineering students.

Variables	Pearson's Chi-square	Asymptotic significance (bilateral)
Sex	189,618 ^a	,000
Age	157,728 ^a	,000
College of provenance	118,106 ^a	,000

In Table 2, it was found that, satisfaction with the university tutor is associated with the factors sex, age and college of origin, obtained a Chi-square $\chi^2 = 189.618a$, $157.728a$ and $118.106a$ respectively, $p < 0.05$ and it is established that personal conditions are associated with satisfaction with the university tutor in engineering students. Satisfaction with tutoring is the guiding and training process, which has the purpose of contributing to the integral development of students, considered the personal, academic and professional areas, which propitiate the professional and life projects [14].

The age factor plays a preponderant role, since peer learning supports the effectiveness of many interesting pedagogies. This study combined peer learning within teams and learning from more capable peers to form a

peer learning model. The effectiveness of using this approach in an engineering grand challenge course was evaluated through pre- and post-tests of students' perceptions of their abilities and focus groups. The results showed that, in a collaborative problem-solving environment, students learned from interacting with each other and from being challenged with alternative perspectives by their peer tutors [36]. Considering peer tutoring is effective in the achievement of engineering students' learning.

Regarding the social status factor, it was found that there is a significant association with the satisfaction of the university tutor. In this regard, some studies reported that the students' perception of the social status of their tutoring partner influenced the results of satisfaction with the tutoring exercised by the tutor; therefore, the school of origin has an impact on the perception of tutoring satisfaction [37]. In this sense, the personal tutor plays a fundamental role in the student's college experience [38]. The personality of the tutor is an important factor affecting how tutors communicate and deal with students, so students would first seek advice from their personal tutors on a variety of issues [39]. Likewise tutoring contributed in creating environments that support and facilitate resilience in students, which enable the achievement of engineering students' academic performance.

Tutoring offers benefits to students, considering that a longer duration of tutoring time, more qualified tutors, and consideration of motivational and sociodemographic variables when tutoring will ensure positive, significant interaction effects between tutoring and improved student learning [40].

It should be specified that tutoring is not only a phenomenon among low-achieving students. High-achieving students seek private tutoring in order to maintain or even improve their good academic performance [41]. Thus, the tutor must have good pedagogical knowledge and is responsible for deciding when and how to intervene [42].

Table 3. Personal factors associated with satisfaction with the organization and contents of the tutoring in engineering students.

Variables	Pearson's Chi-square	Asymptotic significance (bilateral)
Sex	8,876 ^a	,012
Age	23,189 ^a	,000
College of provenance	17,327 ^a	,000

In Table 3, it was found that, satisfaction with the organization and contents of tutoring is associated with the factors sex, age and college of origin, obtained a Chi-square $\chi^2 = 8.876a, 23.189a$ and $17.327a$ respectively, $p < 0.05$ and it is established that personal conditions are associated with satisfaction with the organization and contents of tutoring in engineering students and the level of satisfaction and expectations of students in tutorial activities, uses some indicators to achieve satisfaction such as communication strategies among students, interaction in the face-to-face tutorial class and the ability of tutors to guide student learning [43].

It is necessary to take into account students' attitudes, behavior, and achievements in relation to the Tutor, and it is suggested to use a visualization tool of C Tutor, a widely known program. As a result, in the present study, self-reported student performance (grades), self-reported student progress (improved knowledge and confidence), and self-reported use and usefulness were investigated. Intelligent tutoring systems (ITS) have been consistently shown to improve students' educational outcomes when used alone or combined with traditional instruction [44]. Likewise, intelligent tutoring system (ITS) technology, example follow-up tutors that can be generated without programming alone using cognitive tutor authoring tools (CTAT) [45].

On the other hand, there are tutoring programs to support the learning of engineering subjects and to achieve the learning of students and in that sense an intelligent tutoring system (ITS) that helps during the learning of

programming by using a notation based on a metaphor of roads and traffic signs represented by 3D graphics in an augmented reality (AR) environment. These graphical visualizations can be generated automatically from the source code of the programs thanks to the modular and scalable design of the system. Students can use them by taking advantage of the available feedback system, and teachers can also use them to explain programming concepts during classes. This work highlights the flexibility and extensibility of the proposal through its application in different use cases that we have selected as examples to show how the system could be exploited in a multitude of real learning scenarios [46].

As for the contents of the tutorial in them engineering students, they require topics that enable them a variety of knowledge since they must internalize and understand, but much must be retrieved from external sources, to be interpreted and understood. This knowledge includes elements derived from science, technology, experience, society, economy and many others. It includes objective and subjective forms, especially also "know-how" and heuristic advice, because tutoring should complement and support a rational curriculum and teaching methods, so that it can educate the potential of future engineers, and so that they can be effective as engineers in the shortest possible time [47].

In that sense personal tutors needed support for the organization and contents of tutoring [48]. So it is recommended to have a department that oversees the implementation, monitoring and evaluation of peer tutoring; and collaboration: having regular meetings between student affairs and academic affairs to plan and access the program are key to the success of peer tutoring and the achievement of the objectives.

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