# Monitoring the Efficiency of Brazilian University Education through Based Solutions and Mobile Applications

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## Abstract

Optimizing teaching efficiency is a major challenge in the training process of students. The teaching process was seriously modified by the pandemic due to COVID-19. Communication resources and distance learning platforms are being used with a demand never seen before. However, Brazilian universities are planning to return, even if gradual and monitored, for classroom teaching. So, it is feasible that a tool for assessing the quality of teaching, under the perspective of the students, can contribute to guiding the quality of the class taught by the teacher. Thus, this paper uses the BIG5 model, which is based on dividing the personality into five classification factors described by psychology, to demonstrate the opinion of the students in the institutional evaluation. The research included the development and use of a solution, based on mobile application technologies, for the collection, consolidation and analysis of the individual efficiency of each class, of each teacher evaluated, from the perspective of the students. The study had the permission and consent of each of the involved (teachers and students) at all stages, focusing on an analysis with the rigors and scope that this subject (and its complexity) requires. The experiments were carried out before the academic period. As a result, the developed tool proved to be an effective and efficient means for collecting data and studies aimed at the evaluation and discussion of teaching methodologies during classes, including an assessment of how it will be possible to take into account the pandemic (during and post-COVID-19).

**Keywords:** BIG5, personality, institutional evaluation, feedback, mobile application

## 1. Introduction

Education is one of the most relevant areas that drive the administration and prosperity of a nation. One of the most important figures for such a process is the teacher. These professionals are extremely important for the construction of education, as it is through them that the knowledge is shared.

Several factors contribute to improve the skills of a teacher, and one of these factors is feedback. Without feedback, it is not possible to promote continuous improvement in the methodology and it becomes more difficult to find flaws in the educational process, since feedback works as an efficient strategy for motivation and regulation of learning (Santos & Kroeff, 2018). The evaluation of the efficiency of the class taught demands an external analysis, thus based on the perspective of the student, to promote changes and adjustments to the teaching plan used in the class, in order to seek better efficiency and improvement.

The different view of each student can contribute a lot to the performance of a teacher. In a survey by SmartBrief®, conducted in September 2014, 70% of teachers said that traditional observation processes (institutional assessments) do not produce the feedback needed to grow. Almost two-thirds of school leaders recognized that their school's current assessment systems are not effective and do not support teacher development (Menegão, 2015).

According to Maslow *et al*., (1943), with human needs in hierarchy, the 5ᵗʰ (fifth) level of the pyramid is self-realization. This need is essential for the individual to achieve true personal and professional fulfillment. According to Maslow, in his theory that puts human needs in a hierarchy.

The MET PROJECT (Measures of Effective Teaching Project), started in 2009 by the Bill & Melinda Gates foundation, was created with the aim of discovering how assessment methods could be used to tell teachers about the skills that make them most effective and, to help educational institutions to identify and develop a more appropriate methodology. Today it has more than 3,000 (three thousand) teachers from school districts in the United States and gathers a variety of data, including videotaped classes, student surveys, teacher surveys and supplementary student evaluations (Kane et al., 2012).

Research carried out by the educational perception group together with MET confirmed that teaching and learning do not improve unless teachers obtain high quality feedback from fair and authentic observations by consistent evaluators (Kane et al., 2012 ).

So, based on the importance of feedback for education, does institutional assessment in private and public educational institutions really meet all the needs of the teacher and the student?

In the survey prepared by the authors, the main colleges in Belo Horizonte (a city of the state of Minas Gerais, Brazil) were selected, with a total of 224 participants over a 3-month period, where 48.5% of the students stated that the institutional assessments of their university are tiring and extensive, 8.8% said they were average, and 38.2% said they were quick and simple. However, 63.2% of the students do not believe that changes will occur after carrying out the

institutional assessment, a fact that can generate demotivation to respond to the assessment, thus causing an impact on the result.

Considering the aforementioned problems, the project in this article is based on a new feedback model, together with a study of profiles, both of students and teachers, to demonstrate to the university the importance of effective feedback and how much it can help in training students and the continuous improvement of teachers.

Thus, the objective of this research is to demonstrate the results of a new tool that proposes daily and continuous feedback between student and teacher, throughout the academic semester, explaining the reason for the development of the tool, its creation process, the conclusions obtained and the future work to be carried out.

The specific objectives are: to develop a simple and objective tool to collect the feedback from the classes; find connections between the personalities of the teachers and their respective classes, aiming at a better distribution of teachers / classes in the future; the application of computational methods for data evaluation; provide teachers with the opportunity to measure their own performance during the semester; encourage students to give feedback.

This research is justified by identifying the attitude and motivation of students in the classroom, in relation to institutional assessment, seeking to better understand the motivational cycle of students. This research also relies on the justification of the new parameters for the evaluation of education services that will be weighted by the new social concept imposed by the pandemic situation due to COVID-19 (Favale et al., 2020).

## 2. Material and Methods

### 2.1 Conceptual Analysis

During the research, references were used that address concepts of Mobile Programming, Web Development, Personality Test based on the Big Five model (BIG5) and Institutional Evaluation.

### 2.1.1 Model Big 5

The Big 5 is a model of categorization of the 5 largest dimensions of personality of a wide scope so that anyone can be classified. Created initially by Ernest Tupes and Raymond Christal in 1961, it was used in psychological profile tests for the military and also used as a basis for one of the military projects called LAMP (the Learning Abilities Measurement Program). Currently, Big 5 is also used by companies to select candidates with a certain psychological profile (Jang et Al., 1996).

Personality is a builder of psychology that has always stood out in the field of Psychological Assessment, which is why it has been the source of a large number of theoretical and methodological studies and debates (Pentland & Liu, 1999; Cristani et al., 2012).

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Personality research gained new impetus and direction from the establishment of a consensus about its structure, through the factorial model of personality based on the five factors that is a comprehensive organization of the structure of personality traits (Cobb-Clark & Schurer, 2012).

This model aims to categorize the individual profile in one of its 5 great dimensions, which are: Extraversion, Agreeableness, Conscientiousness, Neuroticism, Openness to experience.

Neuroticism measures emotional instability. People with a high degree of neuroticism are anxious, inhibited, melancholic and endowed with low self-esteem. Those with a low degree of Neuroticism are easy to deal with, optimistic and have a good esteem for themselves. Extroversion is marked by deep involvement with the outside world, people with this personality are usually sociable and friendly.

Agreeableness, also known as sympathy, refers to the way we relate to others. Many points indicate a compassionate, friendly and warm person. At the other end are the withdrawn, critical and self-centered.

Conscientiousness measures the degree of concentration, based on great motivation. People of this personality are disciplined, committed and reliable. People who are open to the experience are adventurous and creative, always willing to leave their comfort zone, like to experience the adrenaline.

Through this method, the personality of each user, both student and teacher, was identified and correlated to the methodology used by teachers with student feedback, finding new methodology standards and analyzing the types of personality that have correlations with each other. It is intended, through this Big Five analysis, to show the academic institution, metrics and values found so that it can elaborate a possible action plan, aiming at effective teaching.

### 2.1.2 Institutional Evaluation

Institutional evaluation, in its general concept, consists of a process that encompasses the different aspects of teaching, research, extension and management of institutions and it is related to the institutional identity. Its legitimacy is based on the involvement and participation of institutions, strengthening their autonomy.

According to *Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira*, INEP (2015), there are two strands of institutional assessment objective in Brazil. The first assumes that assessment is, on the one hand, the University's autonomous act in rendering accounts to society, and on the other hand the assessment is one of the management and decision-making tools of school institutions.

The institutional evaluation has its database based on qualitative evaluation, also using quantitative aspects, aiming at building a collective, flexible, transparent, precise, consistent and mainly reliable evaluation process.

As previous-mentioned, it is clear that the institutional assessment must be conducted as a global, organic, systemic and continuous process, in which the responsibility for its achievement is attributed to the subjects participating in the institution.

The Institutional Evaluation Process presents specific guidelines that consists of an activity intrinsic to the planning process, being a continuous, general, specific process, seeking to integrate actions, thus seeking to know and record the limitations and possibilities of the evaluated work. This is a transparent and ethical process in relation to its fundamentals, focus and, mainly, with regard to the use and dissemination of its results.

### 2.1.3 Related works

Through MET PROJECT several works have been done over the years with the aim of improving teaching through feedbacks. One of these projects, developed and led by Thomas J. Kane and Steven Cantrell in 2010, proposes to put a camera in the classroom so that the teacher can record his classes and review them later, thus being able to view errors, bad practices and in this way, improve the teaching method. In thier proposed Feedback in teaching practice experiment a teacher training workshop addresses a survey focused on student feedback to teachers where 12 teachers were used for the research. According to the authors Thomas J. Kane and Steven Cantrell, feedback promotes a better relationship between teacher-student, academic involvement and better student performance (K-12 Education Team, 2010).

The article brings an effective feedback model, which with its use, teachers can see their flaws and apply some change, either in the teaching method or in their own behavior.

### 2.2 Implementation Methods

Some requirements were raised for starting the prototype development. The development was divided into two aspects: front-end and back-end. The front-end is the development of the entire visual part of the app and the website. The back-end is the part where the business rules are implemented (Bezerra, 2015).

The mobile application was developed using the Fusetools framework which is a set of development tools that allows the user to create designs, to prototyping and to implement high quality mobile applications with multiplatform integration (IOS / Android), which allows a reduction in the cost of time application. The  front-end of the application was developed in UX Markup, an XML-based language for creating native, responsive and smoothly animated interactive components for iOS and Android.

For the website development, the AngularJS framework, developed by Google, was chosen. An API (Application Programming Interface) in C # was created using the IDE (Integrated Development Environment) of Visual Studio for the development of the back end, so that both the application and the website can communicate with the API through HTTP requests. This makes the application and the website work together, seeking information from the same database (Bezerra, 2015).

During the survey of requirements for the prototype to be functional and tested, issues such as resources, agility and objectivity in development were evaluated.

## 3. Results

### 3.1 User Interface

To simplify the institutional evaluation, a simple, fast and objective evaluation model was created that can be done through a Mobile application or in a WebSite. For the student, the interface must allow the student to register on the application / website and evaluate the teacher, in addition to conducting the personality test. The whole development was done thinking about the practicality of everyday life. Figure 1 shows the step-by-step of daily feedback by the application.

*Figure 1: App Flowchart*
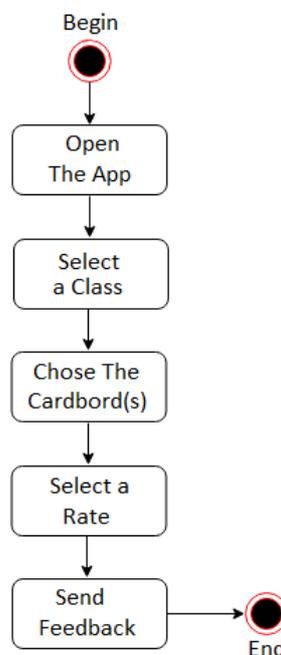


*Source: Authors, 2020.*

Through the flowchart it can be seen that with only 6 (six) steps the student can evaluate the teacher. The evaluation process can take less than 1 (one) minute and may be longer in the first evaluations.

The main screen of the application has two pieces of information: the classes of the current day and the percentage of responses to the personality test, showing how much is missing or if it is already complete.

In addition, it has buttons that redirect the user to the calendar screen or the personality test screen. The calendar has the student's entire class schedule, which must be registered beforehand. By choosing the cardboards, the student has 6 choices of cardboards, with the option of choosing none or choosing several.

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The cardboards include the following texts: Creative; Amazing; Fun; Boring; Terrible; Tiring. The feedback screen has a text box where the student can write feedback to the teacher, as well as an option of ready-made texts based on the cardboards chosen in the previous screen. In this same stage, the student has the option of evaluating the class through the number of stars. Table 1 shows such screens.

The interface for the teacher, as shown in table 2, must contain the classes taught and their respective feedbacks, in addition to the possibility to answer the personality test. The main screen of the application has two pieces of information: the classes of the current day and the percentage of responses to the personality test, showing how much is missing or if it is already complete.

*Table 1: Application screens for the student*



| Calendar screen | Cardboard screen | Rating screen with written feedback and stars | Screen to answer the call list |

*Source: Authors, 2020.*

In addition, it has buttons that redirect the user to the calendar or to the personality test. In the calendar, the entire class schedule of the teacher is shown.

The interface for the coordinator must allow the administration of courses, subjects, teachers and classes, in addition to allowing the viewing of reports generated with the use of students and teachers.
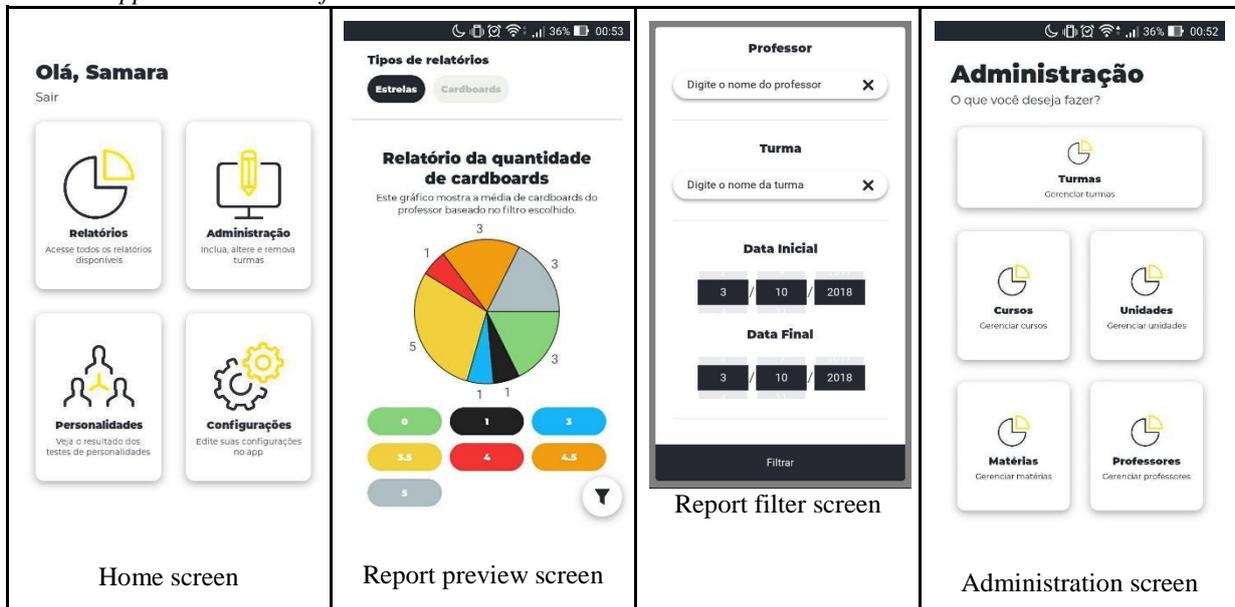
The data management screen allows the CRUD (Create, Read, Update and Delete) of classes, courses, units, subjects and teachers. In reports, it is available the number of stars and cardboards that a teacher has received. The application settings allow the coordinator to view and edit the profile, as shown in Table 3.

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*Table 2: Application screens for the teacher*



| Home screen | Calendar screen | Student feedback display screen | Call list display screen |

*Source: Authors, 2020.*

*Table 3: Application screens for the coordinator*



| Home screen | Report preview screen | Report filter screen | Administration screen |

*Source: Authors, 2020.*

### 3.2 Result of prototype execution

When executing the prototype in 3 (three) classrooms, it demonstrated functionality, easy to understand and visually pleasing. The errors found were corrected. During the test period, which lasted about 3 weeks, 31 (thirty-one) students registered on the application / website.

There were 16 (sixteen) registered teachers. Forty-one assessments were carried out, 32 of which presented written feedback.

The average number of stars given was 3.5 out of 5. The graph in Figure 2 shows the number of stars given during the testing period.

*Figure 2: Number of given stars*
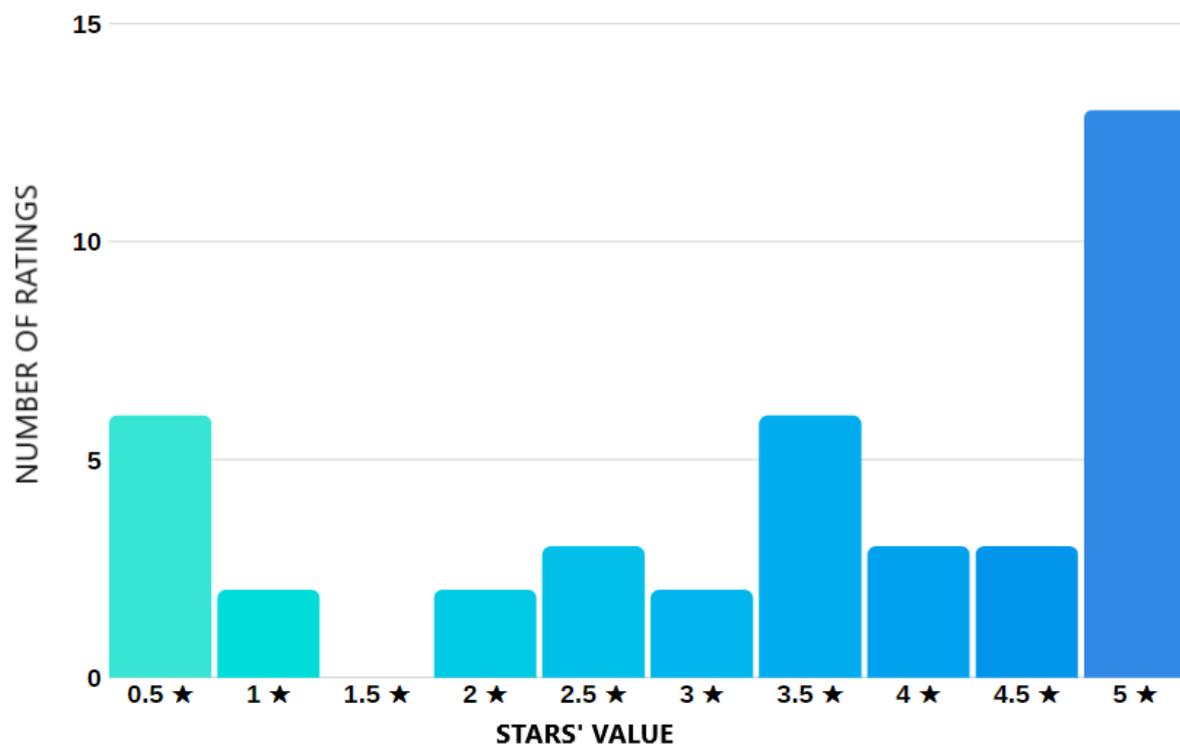


*Source: Authors, 2020.*

It can be concluded, through graph, that not all students are dissatisfied with the current methodology, since the majority rated it with 5 (five) stars.
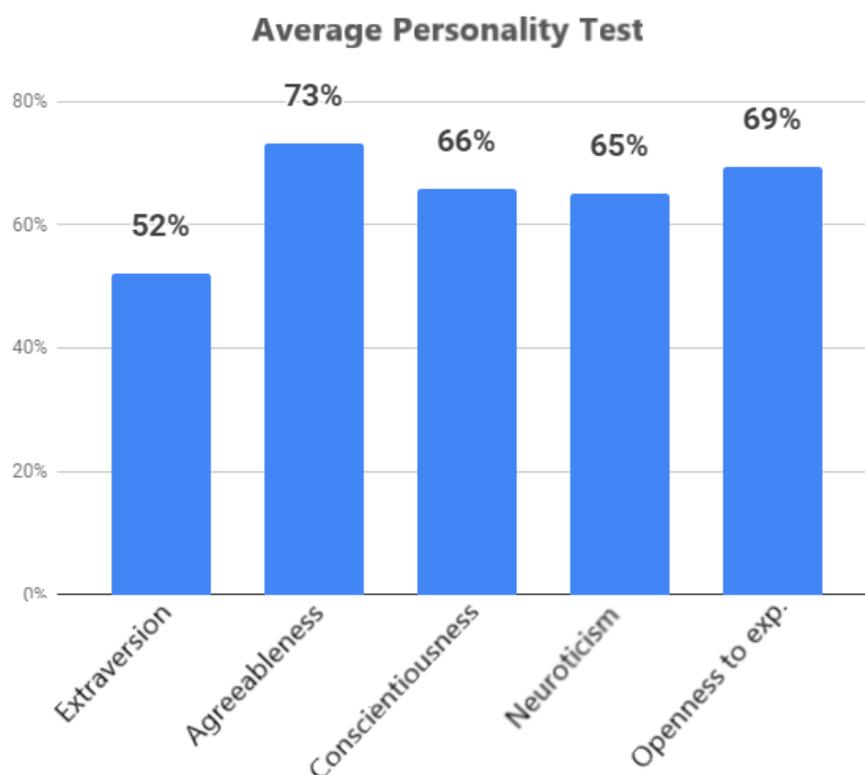
### 3.3    Result of personality tests

During the evaluation period, 20 (twenty) personality tests were performed, composed by 18 (eighteen) students and 2 (two) teachers. In a class where the tests were carried out, the average personality of the 8 (eight) students is shown in the graph of Figure 3.

When comparing the personality test between classes and the teacher, the graph in Figure 4 contains the result of the personality test of a teacher who teaches a topic in the class shown in the graph of Figure 3.

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When comparing the two graphs of the personality tests, the following results are presented in Figure 5. It can be seen in the graph of Figure 5 that the class and the teacher have similar personalities. The biggest difference is in the BIG5 Consciousness factor, with a 15% difference between the class and the teacher. This same class evaluated 13 (thirteen) lessons of this teacher. The average evaluation score was 3.08. These data serve as an initial observation of a project that can help coordinators to better distribute teachers to classes at a university.

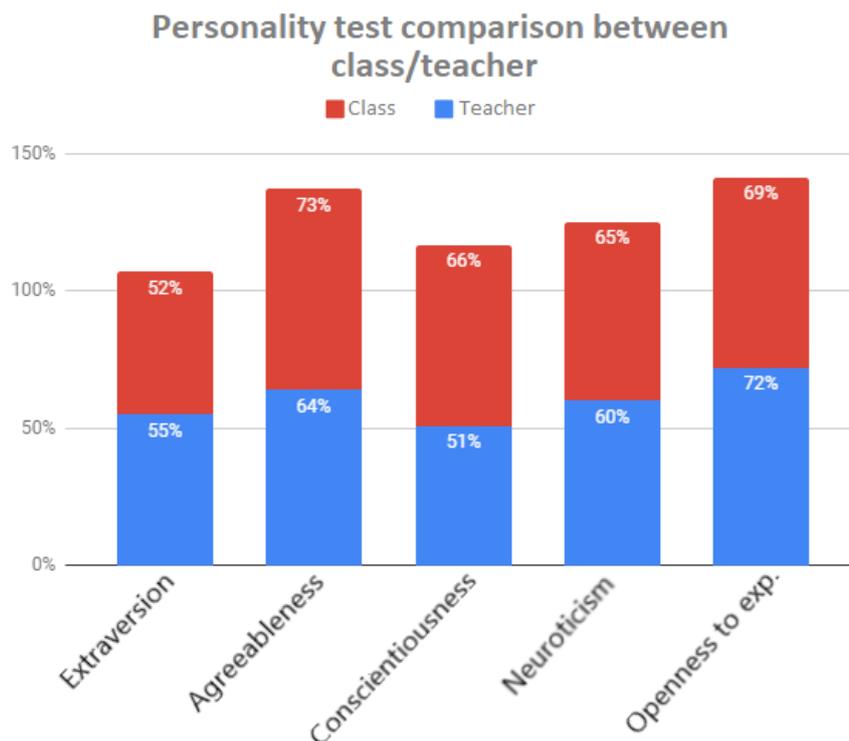*Figure 3: Average personality test of 8 (eight) students in a class*



*Source: Authors, 2020.*

*Figure 4: Teacher's personality test.*
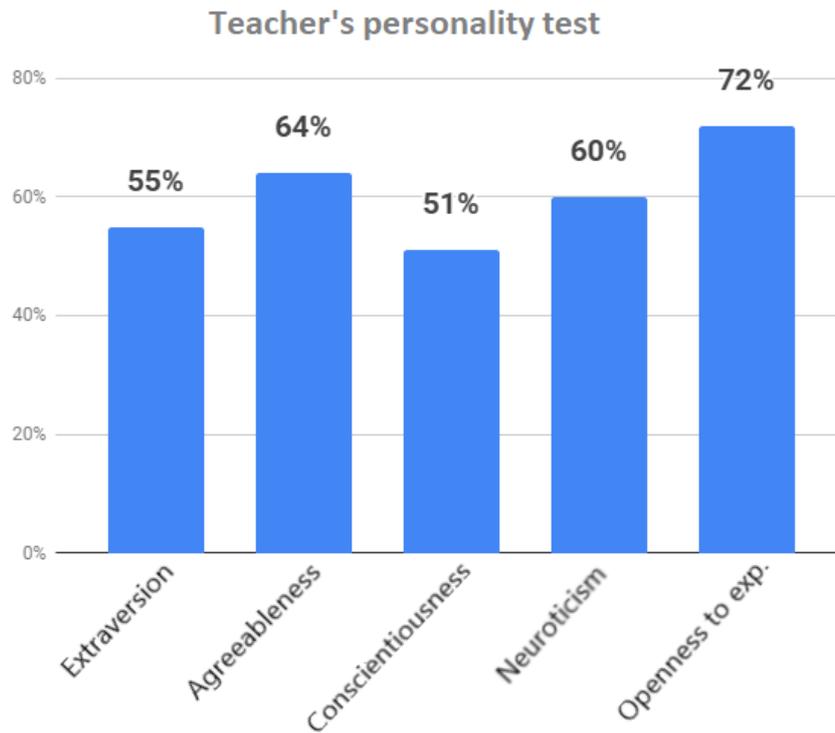


*Source: Authors, 2020.*

*Figure 5: Comparison of personality tests.*



**Personality test comparison between class/teacher**

*Source: Authors, 2020.*

## 4. Conclusion

Through this work, it was concluded that students have an interest in giving feedback to teachers and they, in turn, wish to receive them. The course coordination also showed a lot of interest in the results that the obtained data can generate, mainly the data from the personality tests.

It can also be concluded that as much as the interest of all parties is visible, they still have difficult on changing habits, thus creating a difficulty in implementing and obtaining results on a large scale.

With the personality test and daily assessments, it is possible to find class patterns with teachers, enabling a better distribution in the future.

**References**

[1] Santos, C. M. D. and Kroeff, R. F. D S (2018) A Contribuição Do Feedback No Processo De Avaliação Formativa. *EDUCA - Revista Multidisciplinar em Educação*, Porto Velho, v. 5, n° 11, p. 6-15.

[2] Menegão, R. D. C. S. G (2015) Impactos Da Avaliação Externa No Currículo Escolar: Percepções De Professores E Gestores. *Universidade Estadual De Campinas - Faculdade De Educação*, p. 15-78.

[3] Maslow, A. H. (1943) A Theory of Human Motivation. *Psychological Review*, p 370-396.

[4] Kane, T., Mccaffrey, D., Miller, T. and Staiger, D. (2012) Have We Identified Effective Teachers? *Measures of Effective Teaching Project (MET Project)*, p.4-39.

[5] Favale, T., Soro, F., Trevisan, M., Drago, I., and Mellia, M. (2020). Campus traffic and e-Learning during COVID-19 pandemic. *Computer Networks*, 107290.

[6] Jang, K., Livesley, J., and Vemon, P. (1996) Heritability of the big five personality dimensions and their facets: A twin study. *Journal of Personality*.

[7] Pentland, A., Liu, A. (1999) Modeling and Prediction of Human Behavior. *Neural Computation*, v. 11, n. 1, p. 229-242.

[8] Cobb-Clark, D. and Schurer, S. (2012) The stability of big-five personality traits. Economics Letters, v. 115, n. 1, p. 11-15.

[9] Cristani, M., Blue, A. D., Murino,V. (2013) Human Behavior Analysis in Video Surveillance: a Social Signal Processing Perspective. *Neurocomputing*, v. 100, p. 86-97.

[10]     Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira - INEP (2015). Avaliação Institucional. Available in: http://portal.inep.gov.br/avaliacao-institucional . Access in: 10 Oct. 2018.

[11]     K-12 Education Team (2010) Working with Teachers to Develop Fair and Reliable Measures of Effective Teaching. Measures of Effective Teaching Project (MET Project).

[12]     Bezerra, E. (2015) Princípios de Análise e Projeto de Sistema com UML. *Elsevier Academic*, v.2, n.4, p.645-669.