Emotional Feedback in evaluation processes: Case studies in the University context

Maura Mengoni, Silvia Ceccacci**, Noemi Del Bianco***, Ilaria D'Angelo****, Francesco Paolo Romeo*****, Aldo Caldarelli******, Simone Aparecida Capellini*******, Catia Giaconi********

Abstract
In the face of the growing number of students with disabilities enrolled at the University, it is necessary to rethink the educational and teaching proposals from an inclusive perspective. This necessarily implies careful planning of even one of the most delicate phases of the teaching and learning process for all students: the final exam of a discipline. An event full of expectations and anxieties, very often attention to the construction of a welcoming environment becomes essential to provide the basis for a welcoming atmosphere and success, especially for students with Specific Learning Disorders (SpLDs) or disabilities. Therefore, this contribution, starting from a pilot study conducted by the University of Macerata, analyzes the role of Emotional Feedback in the assessment procedures in university contexts.
Keywords: Emotional feedback; Inclusive university teaching; University students; Disability.

First submission: 07/09/2021, accepted: 10/10/2021
Available online: 21/12/2021

* Associate Professor of Design Tools and Methods for Industrial Engineering the Università Politecnica delle Marche. E-mail: m.mengoni@univpm.it.
** PostDoctoral Researcher of Design Tools and Methods for Industrial Engineering at the Politecnica della Marche. E-mail: s.ceccacci@univpm.it.
*** Ph.D in Special Education, University of Macerata. E-mail: n.delbianco@unimc.it.
**** Ph.D student, University of Macerata. E-mail: i.dangelo@unimc.it.
*****PostDoctoral Researcher, University of Valle d'Aosta. E-mail: f.romeo@univda.it.
****** Videomaker, University of Macerata. E-mail: aldo.caldarelli@unimc.it.
******* Full Professor, at the Speech and Hearing Sciences Department, at São Paulo State Univestiy, UNESP, Brazil. E-mail: sacap@uol.com.br.
******** Full Professor of Didactics and Special Pedagogy at the University of Macerata. E-mail: catia.giaconi@unimc.it.

Doi: 10.3280/ess2-2021oa11911

1. Introduction

Over the past decade the growing number of students with disabilities and Learning Disorders attending Universities has been documented all over the world (Heiman and Precel, 2003; Stacey and Singleton, 2003; Pino and Mortari, 2014; Rivera *et al.*, 2019; Giaconi *et al.*, 2019).

Difficulties experienced by students during their academic career have led to reshape media and redesign teaching methods, to meet their needs. For these reasons, Universities have made inclusive teaching and learning a priority (Kaur *et al*., 2017; D'Angelo and Del Bianco, 2019). However, this challenge is still in place.

Studies (Avramidis and Norwich 2002; Wilde and Avramidis 2011; Kaur *et al*., 2017; Paviotti *et al*., 2021) highlight plural factors (such as lack of professional training, teachers' skills, attitude, inadequate support and resources) that affect the success of inclusive teaching and learning.

While many studies have addressed processes and tools for inclusive teaching only a few research have focused on the issue of inclusive university assessment (Semeraro, 2006; Coggi, 2019).

Starting from the observation that assessment is a delicate phase for all students, the following contribution aims to investigate the role of emotions in assessment procedures in university contexts. Above all, it aims to determine whether emotional feedback analysis tools (Generosi *et al*., 2020; Ceccacci *et al*., 2021) can detect the activation of inclusive processes, with reference to the alignment (or not) between the different students' functioning profiles, the discipline, the teacher's attitude and style (Rossi, 2011; Giaconi, 2015; Rossi *et al*., 2018).

In particular, a pilot study conducted at the Faculty of Education Sciences of the University of Macerata will be presented, involving the application of technologies for the analysis of emotional feedback. In this study, emotion analysis, as we will deepen in the next paragraph, is performed through the analysis of facial expressions collected from both students and professors during the exams, powered by a state of the art emotion recognition system. The main goal is to better understand how the application of technologies, capable of providing feedback about the emotional state of both students and lecturers, can support a more equitable construction of judgements, leading to the consequent redefinition of the assessment context in a more inclusive way.

2. New technologies for emotional feedback analysis

There is emerging evidence that suggests how emotions significantly

contribute to student engagement (Pentaraki and Burkholder, 2017), and on positive academic outcomes (D'Errico *et al*., 2016), especially in academic online contexts.

This has led to a growing interest in methods and tools for assessing student emotional feedback. However, only a few studies have examined student emotional response to the assessment, so that understanding of the emotional impact related to various assessment practices is currently strongly limited (Falchikov and Boud, 2007).

Alongside traditional tools for measuring student engagement, predominantly based on self-reported methods (Beck, 2005; Johns and Woolf, 2006), or data logs directly provided by learning management systems (Hussain *et al*., 2018), new technologies have been proposed to collect data related to students' emotions in an automatic way. They are based on the collection of physiological and neurological measures (e.g., electroencephalogram, heart rate, and skin response) through specialized sensors (Goldberg *et al*., 2011; Xiao and Wang, 2017), the analysis of speech (Albanie *et al*., 2018), or on the analysis of behavioural information through the acquisition of facial movements, head postures and eye gaze (Kaur *et al*., 2018; Whitehill *et al*., 2014).

Among the various emotion recognition methods, those based on the analysis of speech or facial expressions are the least invasive, and probably the most suitable to be used in a learning context. However, the effectiveness of systems based only on speech emotion recognition is still poor, compared to systems based on facial expressions recognition (Karyotis *et al*., 2017).

Facial expression recognition systems are nowadays the technology of choice to automatically perform emotion recognition in a learning context. The extensive use of smart devices (e.g., smartphones, laptops) equipped with cameras have become an integral part of our daily lives, and the use of cameras is so pervasive that we no longer worry about their presence. For these reasons, in this study, we adopted the system described in Generosi et al. (2020), which adopts a hybrid approach and implements a CNN based on Keras and Tensorflow frameworks, trained by merging three different public datasets. This software is compliant with the General Data Protection Regulation (GDPR), the European Union regulation on the processing of personal data and privacy. It enables the discrimination of the "Big six" Ekman's emotions (Ekman and Keltner, 1970), i.e., joy, surprise, sadness, anger, disgust and fearm (plus and the neutral state, corresponding to the absence of manifested emotions), through the analysis of people's facial expressions detected in images or videos. Moreover, the software estimates the positivity or negativity of the emotion recognized frame by frame. To this end, it predicts the Emotional valence (Russel, 1980), through a proper algorithm. The emotional valence is

then computed considering a scale from -100 to +100. In this scale, neutrality corresponds to the value 0, positive values correspond to positive emotions (i.e., happiness and surprise), while negative values to negative emotions, such as anger, sadness, disgust, and fear (Russel, 1980; Mehrabian, 1996).

Moreover, the software also implements systems based on deep learning algorithms described in Generosi et al. (2020) and in Ceccacci et al. (2021) that enable the prediction of people's attention, based on the tracking of the eye gazes and the head posture from the video captured by the camera. It correlates the angle of rotation of the face, with respect to a point of interest for a certain time interval, and the level of attention that the person feels for the point of interest itself[1].

In this study, this technology was used to analyze student's and teacher emotional behaviour in three case studies which will be described in detail in the following paragraph related to the pilot study.

3. Pilot Study

The pilot study was carried out at the Department of Education of the University of Macerata in the academic year 2020-2021 and was coordinated by a multidisciplinary team composed of experts in pedagogy and special education, developmental psychology and experts in human factors and human-computer interaction.

The reasons behind this study lie also in the increase in the enrolment of students with certified disabilities and SpLDs that the University of Macerata has recorded in the last five years (Giaconi *et al*., 2018; Giaconi and Del Bianco, 2019).

Based on the growing number of students, we decided to carry out the pilot study in the Department of Education, Cultural Heritage and Tourism. Students enrolled in the fourth year of Primary Education participated in the research.

A total of 50 students, who took the online oral assessment test in Pedagogy and Special Education, have been involved, including 5 students with a certification for SpLDs and disabilities. In the pilot study, the emotional recognition system (Generosi *et al*., 2020) has been used. Such a system was chosen on the basis of the scientific basis and the criteria of sustainability and low invasiveness previously set out in section 2.

The aim of this study is to analyse the dynamics of the relationship established (at an emotional level) between the student and the lecturer during

[1] The software will consider "interested" a person with face rotation angles, related to the x and y axes, within a range that varies from ± 10 to ± 25 degrees respectively.

the final examination, in order to understand how the lecturer's ability to manage altered emotional states can affect the dynamics of the relationship and the construction of the judgement. In particular, the considered technology was used to investigate the following research questions:

1. Can the use of emotional recognition systems (Generosi *et al*., 2020), which return the emotional state of students with and without disabilities, be an aid to inclusive university teaching and to guarantee opportunities for social equity and "treatment", especially at the time of assessment?
2. Can the use of emotional recognition systems (Generosi *et al*., 2020), which return the emotional feedback in the teacher-student interaction, support the evaluation of the setting and the evaluation process by the teacher during the final examination?

After collecting the consent to participate in the research from each student, the study included an examination registration phase, during which an external observer filled in an Excel table with personal data, the presence of any certifications, the year of the course, the frequency of the course delivered online, participation in part of the teaching, and the final grade. Video recording was carried out over the entire duration of the examination. The videos were collected with specific caution related to recording sitting and then stored in a shared cloud. Video files have been processed frame by frame through the emotional recognition system described above (see paragraph 2), and manually analyzed using video analysis techniques by a multidisciplinary panel of experts.

4. Case studies: materials and methods

As an example, in this paper, we will proceed with the description and the analysis of three case studies, selected among the 50 videos collected in the pilot study, because they are peculiar and exemplify the emotional feedback that can occur during the final evaluation of a student' exam (with or without disabilities) in case of promotion or failure.

Case study 1 is singular because it illustrates the emotional feedback of a student with SpLDs who is conducting the oral assessment test with the compensatory tools, i.e., conceptual maps, foreseen by the law, and who brilliantly passes the oral examination.

Case study 2 photographs the emotional feedback of a student who is conducting the oral examination and who, despite failing the oral examination, manages from the interaction with the teacher to face the rejection as an opportunity to improve his/her preparation and not as a failure.

Case study 3 is singular because of the condition of emotional feedback of students who deal with the contents of the discipline of special education and at the same time have experiences related to the world of disability.

The analysis of the student's behaviour, in the relationship with the teacher, was carried out by comparing the emotional curve, provided by the emotional recognition system, with the results of a manual analysis of the videos conducted by a multidisciplinary panel of experts.

In particular, in the individual analysis of the student's performance, we will examine the emotional development in reference to three moments of the assessment test: the beginning of the examination, the answer to the questions, and the communication of the result.

The description of the results collected for each case is explained below by means of several graphs. In each graph, the duration of the examination is represented on the x-axis and the emotional valence values on the y-axis. The emotional curves related to both and professor are represented considering:

- The frame-by-frame emotional data, provided by the system for the entire duration of the examination;
- The moving average trendline, computed considering a period equal to 10 frames.

The time intervals corresponding to the different moments characterizing the exam (i.e., Introduction, questioning, evaluation), as determined through video analysis, are discriminated using vertical yellow lines and identified on the top of the graphs using capital letters (i.e., I = introduction; Q = questioning moments, E = evaluation), eventually followed by numbers (e.g., Q1, Q2, E1, E2 are used to specify different moments related to questioning or evaluation). Finally, to provide a better understanding of student-professor interaction, the time intervals corresponding to the student and the professor talking are respectively represented under the x-axis.

4.1 Case Study 1

In this study, the emotional interaction of a student with SpLDs, followed by the University's "Disability and SpLDs Service", is analysed. The student (female, 23-year-old) followed the lessons in online mode and previously took part in the exam with positive results. She faces the final exam with compensatory tools, agreed in advance with the teacher in charge of the course, provided for by law and implemented with the support of the educational tutor.

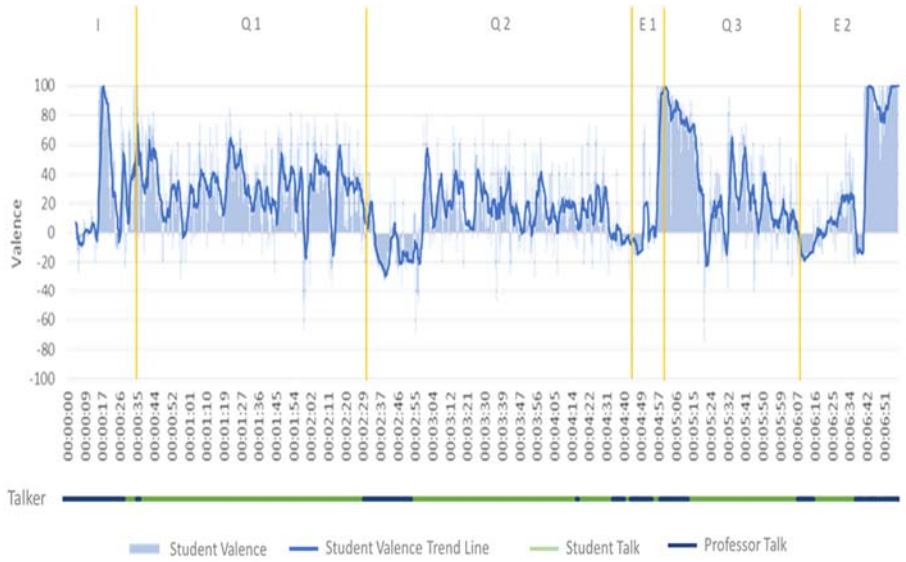

Figure 3 – Student's emotional feedback - case study 1

By analyzing the graph in Figure 3, with reference to the different moments of the exam described above, the first peak of positive valance occurs during the introduction phase (Figure 3, I, from minute 0:17 to 0:26), when the professor is acting on the context of interaction in order to eliminate factors hindering performance, choosing to put the student at ease by inviting her to discuss a topic of particular interest to her. When the teacher moves on to the formulation of a specific question (Q2), the student reports a negative emotional valence (Figure 3, from minute 2:37 to 2:55), which she overcomes thanks to the interaction with the teacher, who supports the student's exposition with illustrative reminders (Figure 3, for example from minute 2:56 to 3:21). The teacher formulates a positive evaluation (Figure 3, E1) which, however, does not correspond to the student's expectation, in fact, it results in a negative valence (Figure 3, from minute 4:42 to 4:52). At this point, the teacher formulates a third question (Figure 3, Q3) to provide the student with an additional opportunity to explicate other concepts from the syllabus. During the formulation of the answer to the professor's third question (Q3), there are further peaks of positive valence (Figure 3, from minute 4:56 to 5:15) on the part of the student who responds appropriately and confidently from the beginning. It is worth noting that the question Q3 is characterized by the same structure as Q2, but different content. As soon as the communication of the positive evaluation and passing of the exam occurs (E2), a positive emotional valence can be observed from the student (Figure 3, from 6:42 to 6:51).

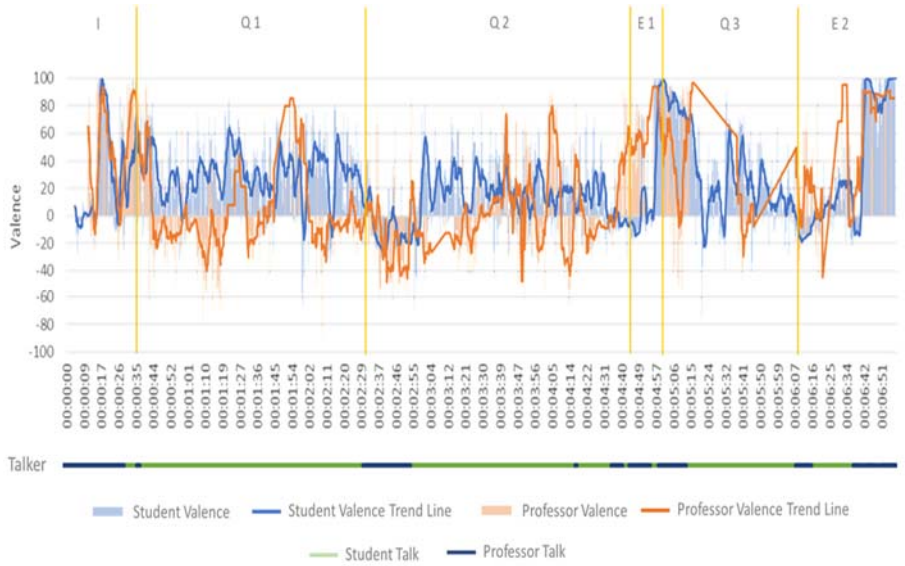

Figure 4 - Student-professor emotional feedback interaction - case study 1

The proposed case study also exemplifies the emotional feedback during the assessment test, through the interaction that takes place between teacher and learner: this can be observed especially in the phases in which the learner, who at some point finds difficulty in explaining a concept, is supported by the teacher who intentionally activates feedback to support the exposure.

In fact, when the student with SLD has to pass from a topic of her choice to a specific question about the exam's program, after a phase of emotional sensitivity, it is thanks to the interaction with the teacher that she returns to have a positive value. (Figures 4, Q2). Another significant element of analysis is represented by the first moment of the evaluation (Figure 4, E1), where the professor, who is communicating the passing of the exam with a positive evaluation, reveals a positive emotional valence that, however, does not find correspondence in the reaction of the student, who shows a negative valence. It is observed from the video that the student, not satisfied with his oral exposition, asks the teacher a third question. The professor, being aware of the specific difficulties of people with dyslexia, proposes a third conceptual linkage question with a similar structure to the previous question. Looking at Figure 4, we can see that as soon as the professor agrees to ask the third question, the valence of the student increases exponentially (see, for example, minute 4:57). The structure of the question chosen by the professor immediately puts the student at ease, in fact, a positive valence continues to be recorded (Figure 4, from minute 5:00 to 5:15). Another illustrative element is given by the pairing

of positive valences between the teacher and the student at the moment of the communication of the positive evaluation and the passing of the exam (Figures 4, E2).

As Romeo (2021a) observes about the appropriateness of investing from an affective point of view in teaching-learning processes and based on studies on emotional development (Sroufe, 2000), we can conclude that the 'emotional availability' of teachers along with their 'mood background' provide as a good 'shape' to the student's emotional mental states during the final exam of a discipline. This should be considered as a capacitating feature of a learning context, and not a critical feature, in which not only disciplinary knowledge should be assessed, but above all the ability to act in front of a given task of the fragile student (Le Boterf, 2000) and therefore his/her resilience in an inclusive perspective (Romeo, 2020).

4.2 Case study 2

In this case study, the emotional interaction of a student who fails the exam is analyzed. The student (33 years old, female), did not attend the online lessons, but participated to the lab related to the course. The student applies to the final exam with the entire syllabus.

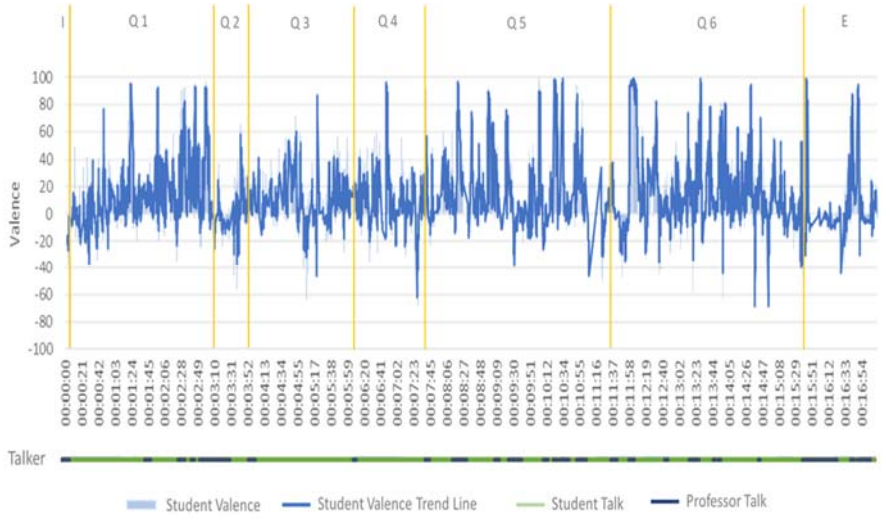

Figure 5 - Student's emotional f*eedback - case study 2*

Analyzing the student's emotional feedback, reported in Figure 5, it is possible to observe a high irregularity and instability in the emotional trend,

which varies strongly between very positive and very negative valence values. In fact, the whole exam is characterized by a significant fluctuation of emotional feedback, with maximum values reaching values of positive emotional valence up to 100 and minimum values, characterized by negative valence, lower than -60.

This fluctuation is observed as early as the first question. The professor, as in the previous case study, chooses to start with a topic chosen by the student (Q1) to put her at ease, but as can be seen from the graph the student's emotional feedback fluctuates from negative valances (e.g. Figure 5, minutes 0:25, 0:40) to rise only slightly in the intervals between minutes 0:25 to 0:40 (see Figure 5). This oscillation is constant throughout Q1. When the teacher moves on to the formulation of a specific question (Q2) there is a negative valence on the part of the student that reaches a minimum of -55 (Figure 5). From the video, it is reconstructed that the student states that she is not prepared regarding the concept formulated in the question. Therefore, the professor asks another question (Q3).

The emotional feedback recorded during the answer to the third question also shows several fluctuations (Figure 5): from the analysis, a positive trend emerges (even if with some oscillations) which reaches a maximum positive valence value at minute 04:55, and then undergoes a rapid decrease in valence values until it reaches a minimum value of about -60. This is then followed by a new upward trend. From the video, we observe a student performance characterized by a hesitant and insecure exposure that emerges from both verbal language (with poorly fluent and inaccurate exposition) and para-verbal and non-verbal language (with facial expressions, eye movements, etc.).

The valence returns to positive values when the professor asks two new questions on two related concepts (Q3 and Q4) to which, however, the student does not answer promptly, alternating recursively positive and negative feedback (Figure 5). The professor proceeds to the formulation of a new question (Q5) connected to the previous one: in this case, the student's emotional feedback results in most in positive valence (Figure 5). This is mainly due, as can be observed from the video, to the interaction with the professor, who activates different supports to favour the exposition. In the case of question Q6, the student's emotional feedback reoccurs with a similar trend. At the moment of the communication of the failure of the exam, the student manifests a negative emotional valence (see Figure 5, E, from minute 15:51 to 16:25) which is reestablished on positive values (Figure 5, E, minute 16:40) when the professor and the student together conduct an evaluation of the overall exam performance, and finally, the professor gives indications to the student to come back with a greater preparation for the next exam (from minute 16:33 to 16:49).

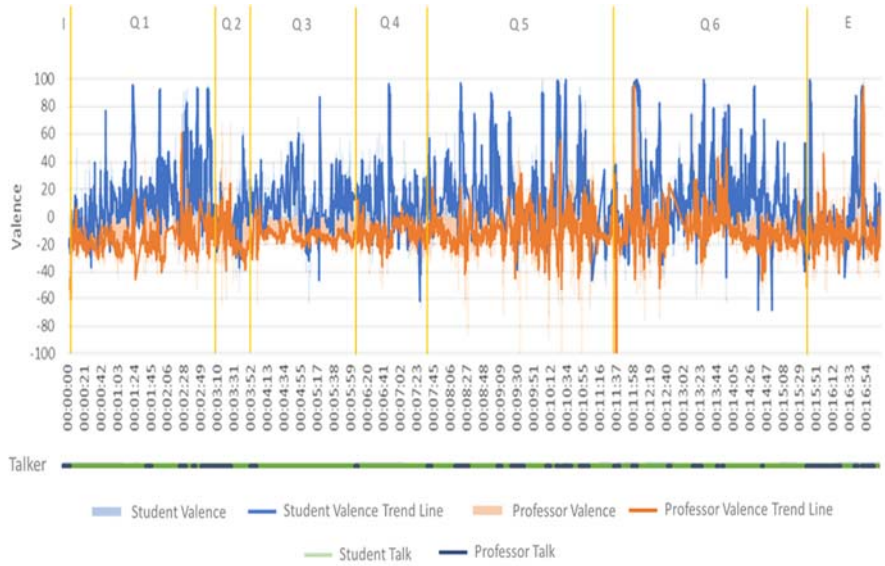

Figure 6 - *Student-professor emotional feedback interaction - case study 2*

The case study exemplifies the emotional feedback that can be established in the teacher-learner interaction in the case of a performance that is not sufficient to pass the exam. During the evaluation test, the teacher intentionally attempts to activate feedback to support the student's exposition even when the answer turns out to be incomplete or incorrect (Q3-Q4-Q5-Q6). Specifically, the present case study highlights the importance of emotional feedback, which allows the teacher to take care of the communication of not passing the exam and to activate personal support to evaluate the progress of the exam and to have indications on how to improve the preparation in view of a new exam call. The graph in Figure 6 shows that in this important phase (E) there is a strong interaction between teacher and student feedback (Figure 6, from minute 15:41 to 17:00).

4.3 Case Study 3

This last case study analyses the emotional interaction of a female student who has a child with a disability. The 35-year-old student, who had been out of school for five years, did not attend the online lessons and did not attend the teaching workshop. The student comes to the final exam bringing the entire program of the course. During the test, as described as follows, the student declares that she has personal and familiar experiences with the subject she has studied.

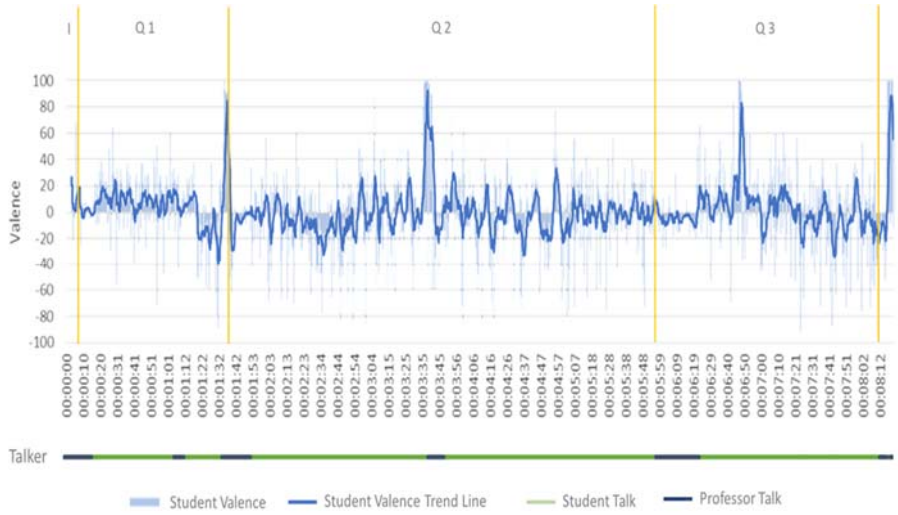

Figure 7 - Student's emotional f*eedback - case study 3*

The student passes the exam brightly. However, graph 6 shows how the emotional feedback curve of the student presents significant fluctuations in the valence values and, in particular, towards negative values. Peaks of positive valance are at the end of the first question (Figure 7, Q1, from minute 1:32 to 1:36), in the central part of the answer of the second question (Figure 7, Q2, from minute 3:35 to 3:40), during the third question (Figure 7, Q3, 6: 50-6: 55) and when the teacher communicates the final score (Figure 7, E, 8:12 minute). Regarding the initial question, the system records a negative valence with a peak at 1:32 (see Figure 7 from minute 1:22 to 1:32). The video analysis points out that the emotional feedback of the student coincides with the moments when there is a correspondence between what she has studied and her personal experience. The valence increases after the teacher's feedback and during the answers to the subsequent questions (Q2, Q3). There is a trend towards negative values more correlated to the personal involvement in the discussed topics than learning performance. This evidence emerges from the video analysis. Specifically, in the second question (Q2), the student is moved, and the valence results in the first part of the curve (Figure 7, Q2, from minute 1:42 to 2:54), settling on mainly negative valence values. The highest peak of emotional interaction can be found during the narration the student does of her emotional experience and her life to which the teacher returns positive feedback (Figure 7, minute 3.35).

In summary, the outline of case 3 represents a significant example of how the emotional alteration can affect the performance of students who deal with

the contents of the discipline of special needs pedagogy and who at the same time have lived connected to the world of disability.

The latter connects learning and real-life and the student's ability to trigger internal resources to face a complex task such as an exam. It underlines how the evaluation process must also consider the characteristics of the student about the path he/she is taking – therefore involving self-assessment requests in the process concerning his/her own learning experience – without risking that the outcome of the exam is interpreted as a judgment of absolute value on the person.

The reaction to a school of "vote" pursuing the goals without any inclusive evaluation has led to many existential "gaps" experienced by preteens and adolescents during the pandemic for Covid-19 and its aggressive variants (e.g., suicidal attempts by young people have risen dangerously since the third wave of the virus). Students would have liked teachers capable of understanding from their faces what they are feeling and then positively orienting their emotions, even though they attended lectures at home without mature and adequate emotional and cognitive tools to face a maximum trauma of this magnitude (Romeo, 2021b).

Furthermore, it is a singular case that shows the usefulness for the teacher of having a support of technologies able to visualize the emotional feedback of the students, which, as in this case, can risk the outcome of the exam not for a failure in preparation but for excessive personal involvement.

5. Concluding remarks

In order to respond in an increasingly effective and efficient way (Perla, 2018) to the demand of diversification according to individual students' needs in the university context, the requirement to design inclusive approaches to training and teaching strategies emerges more and more (D'Angelo and Del Bianco, 2019; Giaconi *et al*., 2018; Pace, Pavone and Petrini, 2018; Perla, 2018).

An activating and personalized academic path, capable of supporting the educational success of the various operating profiles, requires, as highlighted in this contribution, also an inclusive assessment, which can be activated thanks to the analysis of accessibility, opportunities, relevance and the involvement of the students themselves (D'Angelo *et al*., 2020; Kaur *et al*., 2017).

In this direction, assessment plays a fundamental role in teaching and learning processes, becoming a guarantee of equal and fair opportunities (Rossi *et al*., 2018; Giannandrea, 2019).

Specifically, concerning the final exam evaluation, teachers are not asked to formulate summative balances but rather to support the reflection on learning, allowing students to also arrive at suitable self-assessment forms (Rossi *et al*., 2018). In this direction, it is through the feedback generated during the evaluative interaction between teacher and student (Hattie and Clarks, 2018; Rossi *et al*., 2018) that it becomes possible to reach the simultaneous evaluation and self-evaluation action, activating a progressive and joint construction of the knowledge.

Starting from these premises, the evidence that emerged from the pilot study shows how the application of the emotional recognition system can allow, in this initial phase, reflection on the evaluation processes in the light of the different situations and the specificity of the interaction contexts that arise in the final assessment.

Future developments, which provide for the return in a synchronous mode of emotional feedback, will allow a formulation of the evaluation judgment able to recursively adapt in the light of the information that will be received by the teacher, who will thus be able to proceed both with the preparation of interventions aimed at improving the climate and context of the examination, and the identification of procedures for a more accurate assessment.

Emotional feedback in the teacher-student interaction during the final tests is therefore helpful in assessing the setting and the evaluation process.

In this direction, a reorganization of assessment practices is considered necessary through the design of technologies capable of supporting the process of formulating a fair judgment for all students and, in particular, for those with disabilities or specific learning disorders. For these reasons, the achieved results support the importance of training university teachers in the principles and practices of inclusive assessment through specific training actions that can support student-centred teaching that is attentive to their needs (Coggi, 2019). In this latter direction, the peculiarities that characterize the profile of university teaching (Perla, 2018) increasingly require an adequate design of «accompanying devices» (Ivi, p. 83), capable of combining «efficiency (understood as an analysis of the relationship between resources invested in the training course and its objectives) and effectiveness (understood as an analysis of the relationship between the resources invested and the results obtained at the end of the course)» (Ivi, p. 83). In light of these assumptions, we believe that in the dimension of university teaching, it is necessary to introduce a structural evaluation device that can align the different functioning profiles of students, the contents of the discipline, and teachers' evaluation styles.

Further research will focus on the quantitative analysis of the overall sample collected during exams to which the presented pilot studies belong. The final aim will be the investigation of possible relationships between the student's

emotional state and the teacher, their impact on the assessment outcome, and the student's perception of their performance.

References

Beck J.E. (2004). Using response times to model student disengagement. In: *Proceedings of the ITS2004 Workshop on Social and Emotional Intelligence in Learning Environments*, 20: 88-95.

Ceccacci S., Generosi A., Cimini G., Faggiano S., Giraldi L., and Mengoni M. (2021). Facial coding as a means to enable continuous monitoring of student's behavior in e-Learning. *Proceedings of the First Workshop on Technology Enhanced Learning Environments for Blended Education* (teleXbe2021), January 21-22, 2021, Foggia, Italy.

Coggi C. (2019). *Innovare la didattica e la valutazione in Università: Il progetto IRIDI per la formazione dei docenti*. Milano: FrancoAngeli.

D'Angelo I. and Del Bianco N. (eds.) (2019). *Inclusion at the University. Studies and Practices*. Milano: FrancoAngeli

D'Angelo I., Giaconi C., Del Bianco N., and Perry V. (2020). Students' Voice and Disability: Ethical and methodological reflections for Special Pedagogy research. *Education Sciences & Society-Open Access*, 11(1): 112-123.

D'Errico F., Paciello M., and Cerniglia L. (2016). When emotions enhance students' engagement in e-learning processes. *Journal of e-Learning and Knowledge Society*, 12(4): 9-23.

Falchikov N., and Boud D. (2007). Assessment and emotion: The impact of being assessed. In: David Boud, Nancy Falchikov, *Rethinking assessment in higher education*. London: Routledge.

Generosi A., Ceccacci S., Faggiano S., Giraldi L., and Mengoni M. (2020). A Toolkit for the Automatic Analysis of Human Behavior. *HCI Applications in the Wild, Advances in Science, Technology and Engineering Systems Journal*, 5(6): 185-192.

Giaconi C. (2015). *Qualità della Vita e adulti con disabilità. Percorsi di ricerca e prospettive inclusive*. Milano: FrancoAngeli.

Giaconi C., Capellini S. A., Del Bianco N., Taddei A. and D'Angelo I. (2019). Study Empowerment for inclusion. *Education Sciences and Society-Open Access*, 9(2): 166-183.

Giaconi C., and Del Bianco N. (2019). *In azione: Prove di inclusione*. Milano: FrancoAngeli.

Giannandrea L. (2019). Valutazione, feedback, tecnologie in Tecnologie per l'educazione. In: Rivoltella P.C., Rossi, P.G. (Eds.), *Tecnologie per l'educazione,* Pearson: Milano.

Goldberg, B., Sottilare, R., Brawner, K., and Holden, H. (2011). Predicting learner engagement during well-defined and ill-defined computer-based intercultural interactions. In Proc. 4th Int. Conf. *Affective Comput. Intell. Interaction*, 538-547.

Hattie J. and Clarke S. (2018). *Visible Learning: Feedback*. New York: Routledge.

Hussain M., Zhu W., Zhang W., and Abidi S. M. R. (2018). Student engagement predictions in an e-learning system and their impact on student course assessment scores. *Computational intelligence and neuroscience*. Doi: 10.1155/2018/6347186.

Johns J. and Woolf B. (2006). A dynamic mixture model to detect student motivation and proficiency. *AAAI*, 163-168.

Karyotis C., Doctor F., Iqbal R., James A.E., and Chang V. (2017). Affect Aware Ambient Intelligence: Current and Future Directions. In: Aztiria A., Augusto J. C. and Orlandini A. (eds.) *State of the Art in AI Applied to Ambient Intelligence* (Vol. 298). USA: Ios Press.

Kaur A. Mustafa A. Mehta L., and Dhall A. (2018). *Prediction and Localization of Student Engagement in the Wild, 2018 Digital Image Computing: Techniques and Applications (DICTA)*. Australia: Canberra.

Kaur, A., Noman, M. and Nordin H. (2017). Inclusive assessment for linguistically diverse learners in higher education. *Assessment & Evaluation in Higher Education*, 42(5): 756-771.

Le Boterf G. (2000). *Costruire le competenze individuali e collettive*. Napoli: Guida.

Mehrabian A. (1996). Pleasure-arousal-dominance: A general framework for describing and measuring individual differences in temperament. *Current Psychology*, 14(4): 261-292.

Paviotti G., D'Angelo I., Capellini S. A. and Giaconi, C. (2021). Inclusion in university contexts and the role of internships in the education of students with disabilities: Critical issues, perspectives and good practices. *Education Sciences & Society-Open Access*, 12(1): 197-218.

Pentaraki A. and Burkholder G.J. (2017). Emerging Evidence Regarding the Roles of Emotional, Behavioural, and Cognitive Aspects of Student Engagement in the Online Classroom. *European Journal of Open, Distance and E-learning*, 20(1): 1-21.

Perla L. (2018). Formare il docente alla didattica universitaria: il cantiere dell'innovazione. *Riflessioni sull'innovazione didattica universitaria. Interventi alla tavola rotonda GEO (30 giugno 2017)*, 79-88.

Pino M., and Mortari L. (2014). The Inclusion of Students with Dyslexia in Higher Education: A Systematic Review Using Narrative Synthesis. *DYSLEXIA*, 20: 46-369.

Rivera C.J., Wood C. L, James M. and Williams S. (2019). Improving Study Outcomes for College Students With Executive Functioning Challenges. *Career Development and Transition for Exceptional Individuals*, 42(3): 139-147.

Romeo F.P. (2020). *Sollecitare la resilienza. Emergenze educative e strategie didattiche*. Trento: Erickson.

Romeo F.P. (2021a). Investimento affettivo nei processi di insegnamento-apprendimento. Tre criteri per la didattica a distanza nelle emergenze. *Open Journal of IUL University*, 2(1): 267-279.

Romeo F.P. (2021b). Gli adolescenti dell'era Covid. Emergenze, disagio esistenziale e immagini del domani. In: A. Mongelli, a cura, *Altri modi di apprendere. Sociologia, Psicologia e Pedagogia in dialogo*. Napoli: Diogene Edizioni.

Rossi P.G., Pentucci M., Fedeli L., Giannandrea L. and Pennazio V. (2018). From the informative feedback to the generative feedback. *Education Sciences & Society-Open Access*, 9(2): pp. 83-107.

Rossi P.G. (2011). *Didattica enattiva. Complessità, teorie dell'azione, professionalità docente: Complessità, teorie dell'azione, professionalità docente*. Milano: FrancoAngeli.

Russell J.A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, 39(6): 1161-1178.

Sroufe L. A. (2000). *Lo sviluppo delle emozioni. I primi anni di vita*. Milano: Raffaello Cortina.

Whitehill J., Serpell Z., Lin Y., Foster A. and Movellan J.R. (2014). The Faces of Engagement: Automatic Recognition of Student Engagement from Facial Expressions. *IEEE Transactions on Affective Computing*, 5(1): 86-98.

Wilde A. and Avramidis E. (2011). Mixed feelings: towards a continuum of inclusive pedagogies. *Education*, 39(1): 83-101.

Xiao X. and Wang J. (2017). Understanding and Detecting Divided Attention in Mobile MOOC Learning. In: *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, 2411-2415.