Exploring Ethical Considerations and Challenges in Online Assessment

Joan Casas-Roma, Jordi Conesa, Santi Caballé
Universitat Oberta de Catalunya
Department of Computer Science, Multimedia and Telecommunication
{jcasasrom,jconesac,scaballe}@uoc.edu

Abstract. *The use of online learning has grown worldwide in the last years, and the events produced by the COVID-19 pandemic have only served to boost this growth even more. Some authors claim that online learning is more universal, accessible and inclusive than traditional face-to-face education, but is this true? Are there any potential risks proper of online education (and, particularly, of online assessment) that have not been considered yet? This work tries to partially address such question by exploring the main ethical issues and challenges that can appear in the context of online assessment. As the paper shows, online assessment arises some ethical concerns, as well as some technical considerations that might not appear in traditional face-to-face evaluation methods, but which can have a negative and discriminatory effect over some students. This position paper presents some ethical concerns and challenges to consider, classifies them according to their context (social, personal, or educational) and points towards some potential solutions that can help mitigate the detrimental effects of online assessment. The goal of this work is to show that online assessment can have negative effects and add undue burdens unto the students, and to present some preliminary considerations in order to foster reflection and inspire discussion.*

Keywords. online learning, ethics, online assessment, fairness, discrimination

1 Introduction and Motivations

The new disciplinary approach of learning engineering merges breakthrough educational methodologies and technologies based on internet, data science and artificial intelligence (AI). This new approach have completely changed the landscape of online education over the last years by creating accessible, reliable and affordable data-rich powerful learning environments (Dede, Richards & Saxberg, 2018). Furthermore, events such as the recent global outbreak of the COVID-19 pandemic have further enhanced the need for either blended, or fully online approaches to activities such as education –even in institutions, or fields where they had always been carried out in a physical space. As such, many different institutions have had to quickly adapt to a new paradigm that either includes, or is fully dependant on online interaction.

This need has posed a plethora of challenges in a wide variety of contexts. In the case of education, and despite the fact that almost every institution already uses online features in some way, the need to further extend the scope of the remote learning process has often required to rethink and adapt key parts of it to the online medium. One of the challenges that online education currently faces has to do with assessed activities that have been traditionally performed on-site, such as final exams. Some papers already explore the main challenges behind online assessment and provide some guidance and recommendations (Kearns, 2012), (Baleni, 2015), and some recent works specifically focus on recommended practices in the context of the COVID-19 pandemic (Seifert, 2020), (García-Peñalvo, 2021).

When considering how these activities could be moved online, concerns regarding the authorship and legitimacy of the person being evaluated call for the application of new methods to verify the identity of the person behind the screen (Baró et al., 2020), (Bailie & Jortberg, 2009). Some educational institutions see in the use of video-based software a way of remotely monitoring the student throughout the duration of the assessed activity (Hylton, Levy & Dringus, 2016); this can be useful to verify that the person carrying out the activity is, indeed, the student being evaluated, as well as to monitor any unusual activity that could happen during the evaluation.

Nevertheless, with this change of paradigm, the requirements on the side of the student change, too: for instance, the student is usually required to have now a stable broadband connection and an active video feed throughout the assessed activities. In this paper, we aim to provide a first theoretical reflection on how this change of paradigm in assessment could create new ethically-undesirable effects on the students. If online learning environments are meant to make education more universally accessible (The Guardian, 2013), inclusive (Sanchez-Gordon & Lujan-Mora, 2016) and fair, it is important to foresee and understand how

some requirements and side effects of online evaluation could actually jeopardize this by unintentionally creating new burdens and divisions upon different groups of students.

It is worth noting that this position paper does not aim to compare the ethical issues and challenges typically present in online assessment, with those that can be found in different forms of face-to-face assessment. Similarly, this work does not focus on the issues that may arise when having to adapt a face-to-face course to an online course (as recently happened in many face-to-face institutions due to the global pandemic situation). Nevertheless, the fact that many physical institutions have needed to adapt their courses and assessment methods to online environments provides a motivation to explore and reflect about challenges and ethical concerns that could be found in online assessment –whether it was initially planned as the preferred mode of assessment, or forcefully chosen due to major circumstances.

The work behind this position paper has been carried out by following a process of reflective practice (McDonald, 2012) by two lecturers specialized in online education environments, and therefore familiar with some of the challenges that this work discusses. After having briefly introduced our main goal and approach, the rest of this paper is organized as follows: in Section 2, we discuss the main five concerns identified in online assessment, and point out why we claim that they could contribute to creating discriminatory exclusions among the student population, as well as negatively affect the quality of the learning experience; in Section 3, these five concerns are considered according to different contexts (educational, personal and social); in Section 4, we tentatively look for potential ways of evading or, at least, amending those concerns in order to prevent those unfair divisions to appear; finally, in Section 5 we provide a summary of our discussion and point towards some further research that would be needed in this topic.

2 Ethical Considerations in Online Assessment

Regardless of the advantages it might have, online assessment, specially when it is meant to be the only assessment method behind a learning program, is not devoid of ethical considerations. We are particularly interested in understanding whether and how online assessment might be detrimental to students –either by imposing additional requirements to them, by creating unfair divisions and disadvantages over certain social groups, or by affecting the quality of their learning experience due to technological limitations. As shown in Figure 1, we identify five areas that need to be considered from an ethical point of view in order to ensure that online assessment will not create unforeseen disadvantages on some groups of students.

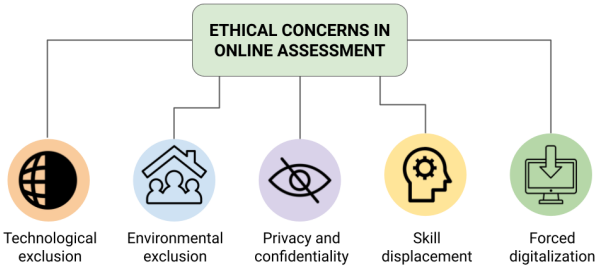

Figure 1: Five ethically-relevant areas to consider in online assessment activities.

2.1 Technological Exclusion and Digital Divide

Because online assessment usually requires additional technological tools that are not present in face-to-face evaluation, the risk of *technological exclusion* is the most obvious concern. In the case of assessed activities, like exams and tests, there is the need to verify that the person taking the test is the student, and not someone else in their place; similarly, there is the need to verify that the student is not receiving help from someone else in the room, or using additional devices, such as mobile phones, to help them in the test.

This can be checked by requiring the student to perform their test in front of a webcam, thus allowing the student to be monitored throughout the assessed activity. This, however, imposes additional technological requirements that not all students might have available at their homes, such as a webcam, or a stable internet connection that guarantees that the webcam image will not be cut off during the test (as this could likely lead to the suspicion that something irregular is going on). Even if a webcam can sound like something "easy" for everyone to have, it might not always be the case, specially in the case of students with a low income. Furthermore, some students might not own a personal computer that they can use whenever they need to, and therefore they might need to share the computer with other members of their household (specially in cases where remote working is mandatory, or encouraged). Similarly, the robustness of internet connection, particularly in certain rural areas, is not as ideal as one might need it to be. Even if this may not be a problem in order to perform online asynchronous work, ensuring that a student would have a stable and reliable connection throughout the development of an assessed activity that is being monitored through the webcam may not always be feasible.

Considering this, it should not be fair to design a method of online assessment assuming that every student would have access to this set of technological re-

quirements at their home. This is specially critical to take into account when one of the arguments that is often used to support online education is that it makes education more accessible to everyone, regardless of their geographical and socio-economical status (The Guardian, 2013). By setting up a "standard" of the technological resources that students *should* have at their private home, what was initially meant to make education more accessible is now at risk of heading towards a different direction: the widening of the digital divide that results from technological exclusion[1]. If online assessment is meant to gain more importance in the future, this could cause the undesirable effect of drawing different social groups even further apart from access to education than they currently are now.

2.2 Environmental Exclusion

Following up on the case of online tests and exams that should be performed synchronously, and while being monitored through some sort of technological tool, such as a webcam, we identify a form of potential exclusion that we call *environmental exclusion*. Assessed activities usually require both a quiet place, where the student can focus on the work at hand, and which is free of distractions and potential interruptions. A private room at the student's home, with no noise and no other people around, would be the standard setting for that.

Nevertheless, not every student may live in a household where they can have such a place for them. Students with a low socio-economic status might be living in small apartments that they may be sharing, for instance, with other family members, or children. In those cases, these students may not have a quiet place, free of interruptions, and at their disposal. Rooms might need to be shared with other people (for whichever reason), other inhabitants of the household might need to use the same space at the same time, and distractions might be unavoidable if there are other people present in the household. Even in cases where the student can indeed has a room, or even a full flat at their disposal, it might be impossible to guarantee that there will not be environmental distractions from outside –construction works in front of the flat, living near a crowded public transport station, or having an industry that uses heavy machinery just in front of the room.

Those students that, either because their home does not have an available space that they can use to focus on an assessed activity, or because there are other external environmental factors that make their available space not adequate, could be in clear disadvantage in front of those who have access to the right conditions to perform an assessed activity. This is not only unfair for those first students, who could easily perform more poorly in those activities as they would have performed otherwise, but it also moves the "burden" of having a suitable space for academic assessment to them. Again, and similarly as it happened in the case of technological exclusion, what was meant to make education more accessible and inclusive can end up imposing a set of requirements that, in the end, widens a division between those students that can have access to such spaces in their homes, and those who cannot.

2.3 Privacy and Confidentiality

Because the student will be, presumably, performing the assessed activities at their home, there are also concerns around the student's *privacy and confidentiality*. Although this might not be a problem for those students who can have a space in their home that is devoted to this kind of activities, other students might need to use, and thus potentially show through webcam, private parts of their home that might not be intended to be shared outside their private life[2]. Furthermore, these spaces might even need to be shared with someone else living in the same household who do not know (or may not explicitly and willingly consent) that this space can be shared online. The images of such spaces may even need to be recorded in order to carry out an evaluation of the activity and the student's behavior during the assessment, if needed.

This issue does not just involve potentially private spaces being shared, but it may also lead to unfair biases being shown during the assessment. For instance, if the place where the student is carrying out the assessment shows some objects that point to certain ideologies (such as religious beliefs, political alignments, etc.), the decisions made by the educator behind the webcam could become, even if unconsciously, potentially biased and discriminatory due to their personal beliefs (Hanna & Linden, 2012), (Sprietsma, 2013), (Botelho, Madeira & Rangel, 2015). While precautions can be taken in evaluation procedures to avoid some unconscious biases (Malouff et al., 2014), sharing images from the student's private home risks compromising all these efforts made in order to ensure a fair evaluation based on the student's own merits, and unaffected by demographics.

Additionally, and in case the student needs to use a shared space in their home, the neutrality that the student may want to seek for that space becomes a require-

[1] Currently, these technological requirements belong solely to online institutions where students have already been informed about these requirements. Nevertheless, it is worth taking into account how, if education is progressively reshaped towards more technologically-demanding environments, that could make education more difficult to access by certain social groups with less access to technological resources.

[2] There have already been, and specially during the first few months of generalized remote work imposed by the COVID-19 outbreak, cases of people who unknowingly showed some potentially controversial, or inappropriate objects in the background during a meeting. Although some could argue that those objects should not have been there, provided that the person was in a work meeting, that space is also meant to be part of that person's private home.

ment that is somehow imposed to other members of the household, and who might find themselves needing to "de-personalize" a space in their own home in order to protect their privacy and confidentiality during the online assessed activities.

2.4 Skill Displacement

Different assessment methods usually evaluate different skills. Due to potential concerns regarding the identity behind the person carrying out online continuous assessment activities, a solution that has been proposed is to schedule regular synchronous short meetings between the educator and the student in order to check that the student is, indeed, the one who carried out the work that has been delivered. Just as it happens with any other skill, some students might feel more comfortable, and be more naturally prepared, to interact synchronously with their teacher and answer questions in real time that might affect their overall evaluation[3]. In that case, those students who struggle in those activities, maybe simply because they get easily anxious when facing an assessed activity, or get what is starting to get known as "Zoom fatigue" (Bailenson, 2021), could perform poorly and thus see their overall grades affected because of this as a result of a *skill displacement* effect on the methods used for evaluation.

However, and as we have previously said, different assessment methods can be used to assess different skills; therefore, one could argue that those students who perform worse in asynchronous activities, but better in synchronous ones, are the ones being currently unfairly graded because of this. Nevertheless, the truth is that these methods introduce a displacement (or, at least, a change of weights) from one set of skills, to another. This phenomenon could also negatively affect the quality of what is being taught, in cases where this methods is adapted simply as a way of verifying identity, but which does not actively contribute to improving the students' learning of the module at hand. The questions, then, should be whether what is being taught and learned benefits from this introduction of new skills that play a role in the evaluation (which, in this case, the introduction of more synchronous activities could be seen as a chance to improve the learning), as well as whether this displacement can have a negative impact on the students, their learning process and their overall results.

[3]It should be noted that interviews and oral exams are already an existing assessment method in face-to-face evaluation. In this case, the issue with this kind of assessment would come in when that method is used as an *ad hoc* solution to a course that has been moved online, but was not initially planned to. In that situation, this method of assessment could not provide any additional value to the module's evaluation, and be used only as an easy way to verify authorship at the expense of displacing the skills that were initially planned to be assessed in that module.

2.5 Forced Digitalization

Computers might have some advantages over pen and paper (for instance, writing text in a computer is often quicker, can be modified easily, and the educator marking a computer-written text should not have any problems having to deal with cryptic handwriting), but it also have some limitations. For example, schematic figures, drawings and structural sketches are usually harder to do on computer-based tools than they are on pen and paper. As such, certain skills and modules are better evaluated on a pen and paper support: aside from modules that explicitly require artistic skills (such as drawing), IT modules involving conceptual design, flow diagrams, etc. are usually more convenient and natural to do on pen and paper. The whole process of drawing a conceptual diagram can help unfold one's own creativity and the depth in which the task at hand is understood, which might require a quick rethinking of the whole diagram. Similarly, skills that use special sets of symbols, such as symbolic logic, mathematics, etc. can be hard to write down in a precise way by using a computational setting.

The generalized application of online assessment activities could risk a *forced digitalization* imposition to skills and modules that would better be assessed in a non-digital platform. A tendency to this forced digitalization might appear due to the inherent limitations that online learning environments and technological supports, such as computers, have, and in case of an abrupt and rushed transitioning to online assessment methods. In that case, educational institutions could be tempted to change how the educational content is assessed in ways that would be detrimental to their teaching and learning, thus negatively affecting the students' learning experience due to decisions that are not pedagogical, but rather constrained by technological limitations. For instance: if, instead of asking the students to draw a flow diagram for a software engineering module, or to write down a complex operation in a mathematics module, they were presented with a multi-answer test featuring various possible diagrams, the students could indeed show that they know what the correct diagram, or the answer to the mathematical operation, should be, but would not be assessed on whether they are capable of building the diagram (or solving the whole operation) on their own and from scratch. This issue could, of course, be avoided by allowing the students to solve these exercises on paper and then scan and upload a digitalized copy. Nevertheless, in modules where such procedure is needed, it should be kept in mind that the workload of the teachers behind the online environment will be superior than those of the modules that can be evaluated through other, more automatized methods –such as multi-answer tests. This consideration may be relevant in terms of module scalability in order to ensure that the student-to-teacher ratio is kept manageable to allow such method of evaluation.

3 Context of Ethical Considerations

Each one of the five identified concerns can be related to different contexts surrounding the students and their learning. This relation can be used to understand whether and how these concerns can potentially affect certain groups of students, and can be helpful in order to identify possible ways in which they could be amended –or, at least, ways in which their effect could be mitigated. In (Casas-Roma & Conesa, 2021) and (Casas-Roma, Conesa & Caballé, 2021), we define a multi-dimensional approach that distinguishes between the *Educational layer*, the *Personal layer* and the *Social layer* of students. This distinction is presented to argue how ethically-relevant scenarios in education should take into account the effects of all three layers in order to provide a comprehensive and fair conception of the students, their socio-economic context and their learning process.

Even though the case at hand is different from the ones we discuss in the aforementioned previous works, we can still recognize a relation between the five ethical concerns in online assessment, and the multi-dimensional model of the students (as it appears in Figure 2):

- *Social context*: Concerns belonging to this area depend directly on the student's social, economical and geographical context. Differences in the student's context (for instance, household income, family, social groups, location, etc.) are usually key to determine whether the concerns identified are actually applicable to the particular case of a student. In this sense, concerns about *technological exclusion*, *environmental exclusion* and *privacy and confidentiality* (partially, in this last item, and referring to privacy in the student's household where they carry out their assessed activities) fall in this category.

- *Personal context*: Concerns belonging to this area depend on the student's personality, their skills and knowledge, and their emotional and motivational states, among others. Regardless of the social context, differences in the way the student relates to the world, or approaches their learning, or how easily the student handles tasks that require a certain skill set, are relevant to determine how significant the identified concerns are. These include concerns regarding *privacy and confidentiality* (partially, in the sense that we are now referring to the student's own personal privacy), as well as *skill displacement* (also partially, as the educational institution should also be involved in foreseeing what skills the students need to use in each case).

- *Educational context*: Concerns belonging to this area relate neither to the student, nor to their social context; instead, they have to do with the content of what is being taught and learned through the educational process, as well as with how the students' learning experience is tailored. In a way, they relate to what comes "before" the student, as they have to do with the way the educational materials are prepared and adapted to be used in online assessment. The concerns identified that we map to this dimension correspond to the *skill displacement* (partially, as it refers to what skills and abilities should be required in order to perform certain learning activities), as well as to the *forced digitalization* of the educational content.

Aligning the five ethical concerns with the social, personal and educational contexts facilitates the understanding of the dimensions behind the ethical considerations and the motives and causes that may be at their root, as well as allowing to identify to whom falls the responsibility to provide solutions to mitigate them.

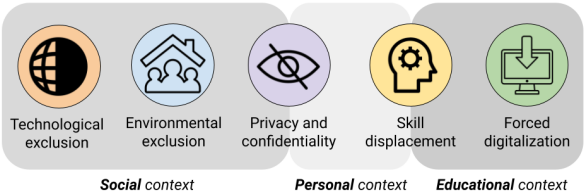

Figure 2: Ethical concerns classified according to the dimension they affect.

4 Towards Potential Solutions

After having identified the main potential ethical concerns that can be found behind the generalized application of online assessment processes, we now briefly discuss potential solutions, as well as potential recommended practices, that could be followed to mitigate those undesirable effects. The proposed list does not pretend to be complete, but it still provides some potential solutions to promote reflection and discussion.

- *Technological exclusion*: Changing the main paradigm in online assessment should not contribute to widen the digital divide by imposing an additional burden to those students who have less access to technology. Even though online assessment might inevitably need to use additional technology, such as a synchronous webcam connection to verify identity and avoid some kind of plagiarism –possibly complemented with other, less invasive methods such as a keystroke pattern analysis system to provide further evidence of the student's identity. It is key to consider how these needs could be adapted in order to prevent technological exclusion. In this sense, designing alternative ways of carrying out online assessment activities that, while still ensuring that those activities will be academically fair, can be adapted to those students with limited access to

technology[4], would help prevent the widening of the digital divide gap.

- *Environmental exclusion*: The students should not be made responsible for ensuring that their home has an adequate space (quiet, with no interruptions, ensuring a good broadband connection, etc.), on a specific day and time, to carry out an assessed activity. At the very least, and because every student and every household might have their own particularities, flexibility should be given to students to choose their own day and time. This, however, might not still be enough to guarantee that the space will be the appropriate one (as there might still be unforeseeable interruptions, noise, etc., even from outside the student's immediate environment). A potentially better solution would be that the education center provided alternative on-site spaces that students could attend to carry out the assessed activities; this way, the educational center could ensure that those spaces are adequate for the assessed activity and, furthermore, could also provide the technological equipment needed for it.

- *Privacy and confidentiality*[5]: Because the student would be carrying out the assessed activities in their own home, requiring the student to devote a "neutral" space for this purpose might lead to a form of environmental exclusion; not every student might have the chance to prepare such a space in their household. Although one might initially think that applying a filter to blurry the image background could help preserve the student's private home intimacy, this could lead to concerns in terms of academic integrity, as someone could argue that the student may use this blurrying to their advantage, for instance by hiding notes, people or resources that could give an unfair advantage in the assessed activity. Similarly as in the previous point, an on-site space provided by the educational center would allow the students to attend this "neutral space" without the risk of exposing their private home.

- *Skill displacement*: In case frequent synchronous interactions are required as part of the assessment process, their weight should be well-balanced with the rest of the assessed activities. If, for instance, these synchronous interactions are mainly scheduled as a way to verify the student's authorship of an asynchronous activity, the weight those interactions have in the overall assessment should be kept to a minimum, and thus be constrained to mainly a matter of verifying the identity of the author. If these synchronous interactions are meant to have a meaningful impact on the overall assessment, they should be complemented with other activities that draw from a different set of skills (for instance, asynchronous activities based on reflection and individual work) to prevent disfavouring those students who are not as prepared for synchronous interactions than others.

- *Forced digitalization*: The quality of the students' learning should be the primary focus on education: therefore, decisions regarding the medium used to teach certain content and skills should never be made according to the most technologically-convenient way to include those contents in online assessment activities. For example, if students would usually need to use pen and paper to draw some diagrams as a key part of their learning, this should not be replaced by a battery of multi-answer tests just because the tests are easier to design, present and grade in an online assessment context. In cases where a non-digital medium is preferred, the online assessment activities should be designed in such a way to accommodate those preferences. In other words: implicit limitations that technology and digital environment might have should never act as limiters on something that would be better taught, practiced and assessed otherwise.

5 Remarks and Future Work

In this position paper, we have identified and discussed potential ethical concerns and challenges that can stem from a generalized application of online assessment activities in online learning environments. The progressive digitalization that many educational institutions are moving towards, accelerated by the outbreak of the global COVID-19 pandemic in 2020, could contribute to this effect even further. As we have shown in this paper, despite the benefits that online assessment might have, it can also have unintended detrimental and discriminatory effects over certain groups of students that could defeat the purpose of making education more inclusive, universal and fair for everyone, as well as potentially affect the quality of the students' learning experience due to reasons that are not grounded in pedagogical interests, but rather on technological constraints.

In particular, we have identified concerns relating the following main topics: 1) access and availability to technology, which might grow in the case of generalized online assessment; 2) access and availability of suitable physical spaces to carry out assessed activities, which might greatly vary between different social and economical student profiles; 3) privacy and confidentiality concerns, which derive from the fact that synchronous, video-supported activities might need to be carried out in the students' private home; 4) dis-

[4]The second potential solution proposed in the next item (environmental exclusion) would also help solve this point for students without the chance to access the required technology.

[5]We already assume that the data gathered and used in those online assessed activities will be treated and processed according to the GDPR, as well as any other data privacy regulations. Our discussion goes along the line of what we discuss in the "Privacy and confidentiality" part of Section 2.

placement of the skills needed for the students to carry out assessed activities, in case synchronous, interview-based activities are set in order to verify the students' authorship of the assess activities, and; 5) potential loss of pedagogical value in certain evaluated tasks due to the forced digitalization of the educational content.

For each of those concerns, we provide a brief reflection that looks for possible ways of addressing and minimizing them. These reflections try to understand what dimension the identified concerns relate to, as well as who and how could help mitigate them. We believe that it is of uppermost importance to ensure that the changes derived from a potential generalized digitalization of education (and, in particular, of assessment and evaluation activities) do not constitute a new added burden for the students to bear and address –or, in case they cannot do so, constitute a new exclusionary divide.

Even though this reflection is mainly theoretical, it would be interesting to see how these considerations are treated in the new forthcoming paradigms that many educational institutions are adapting. Therefore, an interesting line of future work would be to carry out some case studies of particular institutions and check whether and how they address these concerns in their online assessment methodologies.

Acknowledgments

This work has been partially supported by European Commission through the project "colMOOC: Integrating Conversational Agents and Learning Analytics in MOOCs" (588438-EPP-1-2017-1-EL-EPPKA2-KA) and by a UOC postdoctoral stay.

References

Bailenson, J. N. (2021). Nonverbal overload: A theoretical argument for the causes of Zoom fatigue. *Technology, Mind, and Behavior*, 2(1).

Bailie, J. L., & Jortberg, M. A. (2009). Online learner authentication: Verifying the identity of online users. *Journal of Online Learning and Teaching*, 5(2), pp. 197-207.

Baleni, Z. G. (2015). Online formative assessment in higher education: Its pros and cons. *Electronic Journal of e-Learning*, 13(4), pp. 228-236.

Baró, Xavier and Bernaus, Roger Muñoz and Baneres, David and Guerrero-Roldán, Ana Elena. (2020). Biometric tools for learner identity in e-assessment. *Engineering Data-Driven Adaptive Trust-based e-Assessment Systems*. Springer. pp. 41-65.

Botelho, F., Madeira, R. A., & Rangel, M. A. (2015). Racial discrimination in grading: Evidence from Brazil. *American Economic Journal: Applied Economics*, 7(4), pp. 37-52.

Casas-Roma J., Conesa J., Caballé S. (2021) Education, Ethical Dilemmas and AI: From Ethical Design to Artificial Morality. In: Sottilare R.A., Schwarz J. (eds) *Adaptive Instructional Systems. Design and Evaluation*. HCII 2021. Lecture Notes in Computer Science, vol 12792. Springer, Cham. https://doi.org/10.1007/978-3-030-77857-6_11.

Casas-Roma, J. & Conesa, J. & Caballé, S. (2021). Grasping the Shape of Ethical Dilemmas: Towards an Educational Dilemma Generator. *Proceedings of The Learning Ideas Conference* (forthcoming).

Dede, C., Richards, J., & Saxberg, B. (eds). (2018). *Learning engineering for online education: Theoretical contexts and design-based examples*. Routledge.

García-Peñalvo F.J., Corell A., Abella-García V., & Grande-de-Prado M. (2021) Recommendations for Mandatory Online Assessment in Higher Education During the COVID-19 Pandemic. In: Burgos D., Tlili A., Tabacco A. (eds) *Radical Solutions for Education in a Crisis Context*. Lecture Notes in Educational Technology. Springer, Singapore. doi:10.1007/978-981-15-7869-4_6

Hanna, R. N., & Linden, L. L. (2012). Discrimination in grading. *American Economic Journal: Economic Policy*, 4(4), pp. 146-168.

Hylton, K., Levy, Y., & Dringus, L. P. (2016). Utilizing webcam-based proctoring to deter misconduct in online exams. *Computers & Education*, 92, pp. 53-63.

Kearns, L. R. (2012). Student assessment in online learning: Challenges and effective practices. *Journal of Online Learning and Teaching*, 8(3).

Malouff, J. M., Stein, S. J., Bothma, L. N., Coulter, K., & Emmerton, A. J. (2014). Preventing halo bias in grading the work of university students. *Cogent Psychology*, 1(1).

McDonald, K. (2012). Is reflective practice a qualitative methodology?. *Nurse education today*, 33(1), 13-14.

Sanchez-Gordon, S. & Luján-Mora, S. (2016). How could MOOCs become accessible? The case of edX and the future of inclusive online learning. *Journal of Universal Computer Science*, 22(1), pp. 55-81.

Seifert, T. (2020). Student assessment in online learning: Challenges and effective practices during

Covid-19. In *EdMedia+ Innovate Learning* (pp. 106-108). Association for the Advancement of Computing in Education (AACE).

Sprietsma, M. (2013). Discrimination in grading: Experimental evidence from primary school teachers. *Empirical economics*, 45(1), pp. 523-538.

Online universities: it's time for teachers to join the revolution: The Guardian, 2013. https://www.theguardian.com/education/2013/jun/15/university-education-online-mooc