

Elaastic: A web application for the orchestration of formative assessment sequences

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Software

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Summary

[Elaastic](#) is a web-based application that allows teachers to implement formative assessment sequences with large groups of students, during face to face or distance courses. The application implements different workflows depending on the learning context. These workflows consist of at least 4 phases : (1) the teacher to ask a choice or open-ended question to his/her group of students, (2) the students to answer the question by providing a written justification. The system then organises (3) a peer review of the various contributions and processes all the collected data so that (4) the teacher and each student receives feedback relative to the answers. The sequence then usually ends with a discussion between teacher and students based on the provided feedback ([Figure 1](#)).

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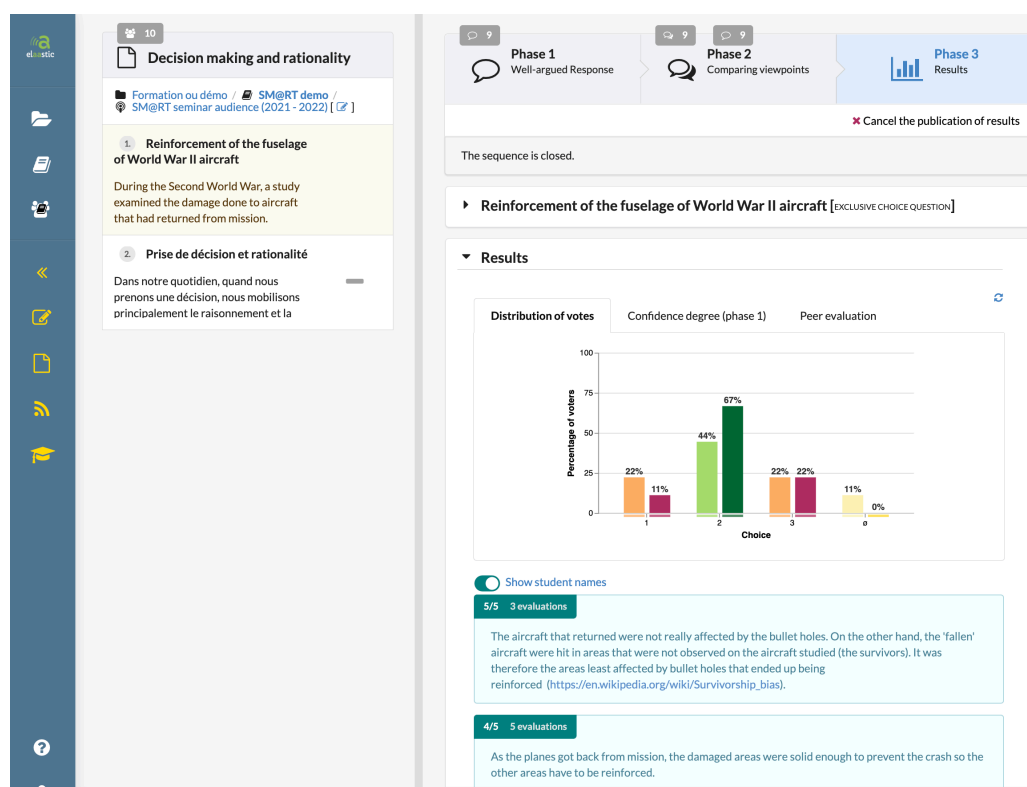


Figure 1: Elastic - Interface presenting feedback to the teacher during the sequence.

Statement of need

Elaastic and its ancestor Tsaap-Notes, have been developed in the context of research conducted by the [TALENT team at IRIT](#) on the design and implementation of formative assessment systems. First inspired by the Peer Instruction process ([Crouch & Mazur, 2001](#)), we use technology to improve formative assessment processes on different dimensions: context of use, types of interactions or students engagement in complex tasks such as written argumentation ([Silvestre, 2015](#)). The newly designed processes were also used to improve feedback in the online tests provided to students as revision tools. ([Silvestre et al., 2015, 2017](#)). Finally, recently, we are using learning analytics on data collected since 2015 to elicit links between the different variables characterising a formative assessment sequence. We exploit the results to help teachers in their decision making during sequences orchestrated with Elaastic ([Andriamiseza et al., 2021a, 2021b, 2021c](#)).

For all these research works, we use Elaastic to conduct experiments in ecological contexts in different institutions of higher education and recently in secondary schools. Between 2015 and 2021, the platform has been used by more than 60 teachers, with around 4800 distinct students providing more than 30000 textual responses in the context of the activities orchestrated by Elaastic.

Main features

As a teacher

Elaastic allows teacher to create assignments for students. An assignment is composed of several questions that can be of different types : exclusive choice, multiple choice or open-ended. [Figure 2](#) presents the interface allowing the edition of a multiple-choice question.

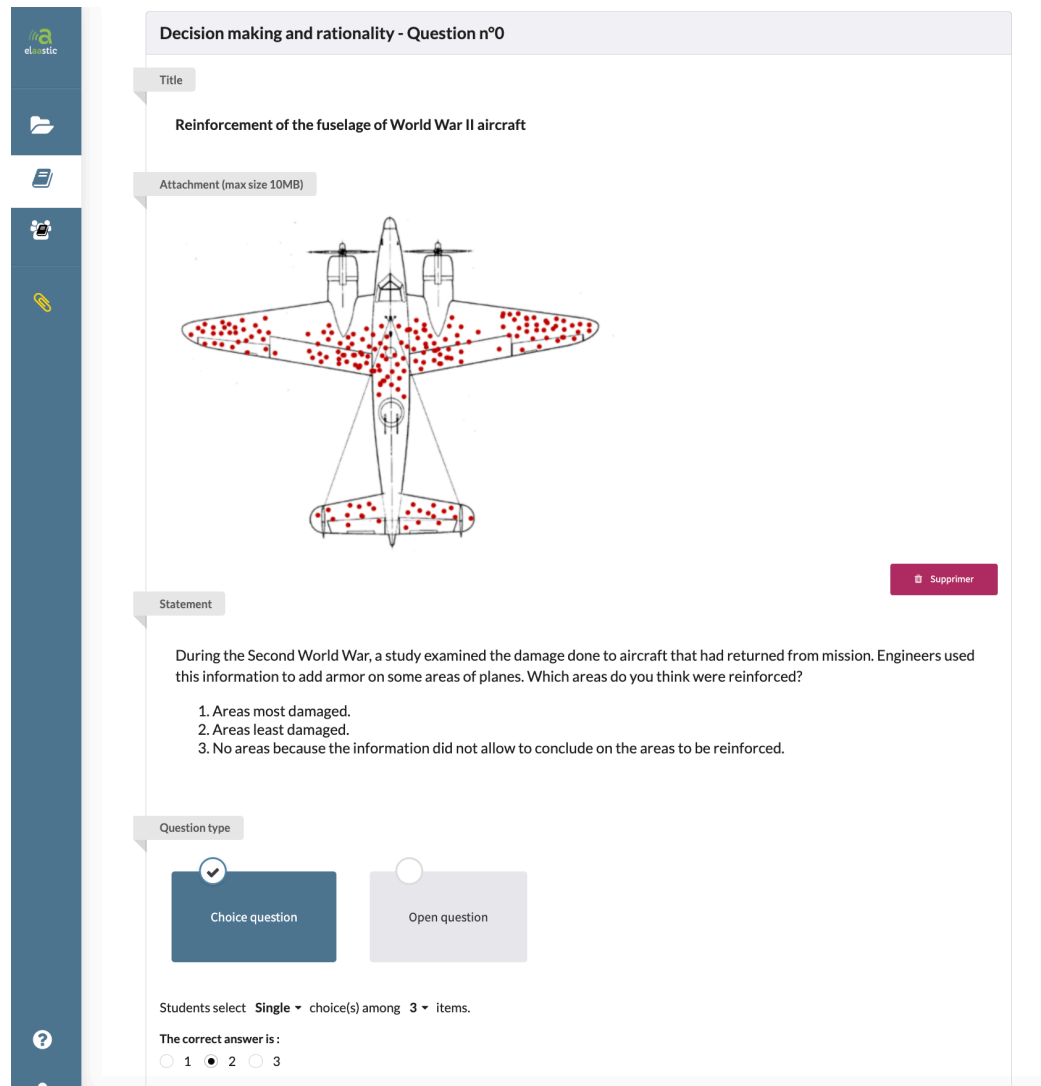


Figure 2: Elaastic - Interface for teachers to edit a question.

When an assignment is ready to be played by students, the teacher can switch in the *player* mode to orchestrate sequences based on assignment's questions. [Figure 3](#) presents the interface of the player for the teacher. It contains action buttons allowing to start and stop the different phases of a sequence corresponding to a question.

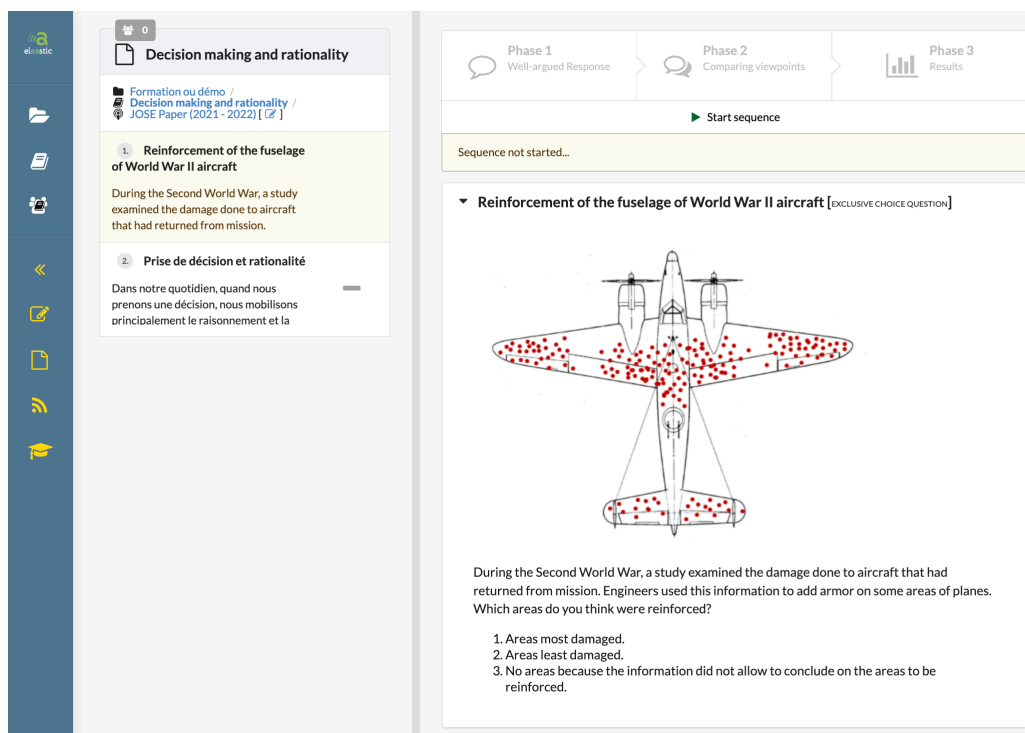


Figure 3: Elastic - The *player* mode for teachers to orchestrate a sequence.

When starting a sequence, the teachers configure the current sequence specifying the learning context and some other characteristics of the sequence as showed in Figure 4.

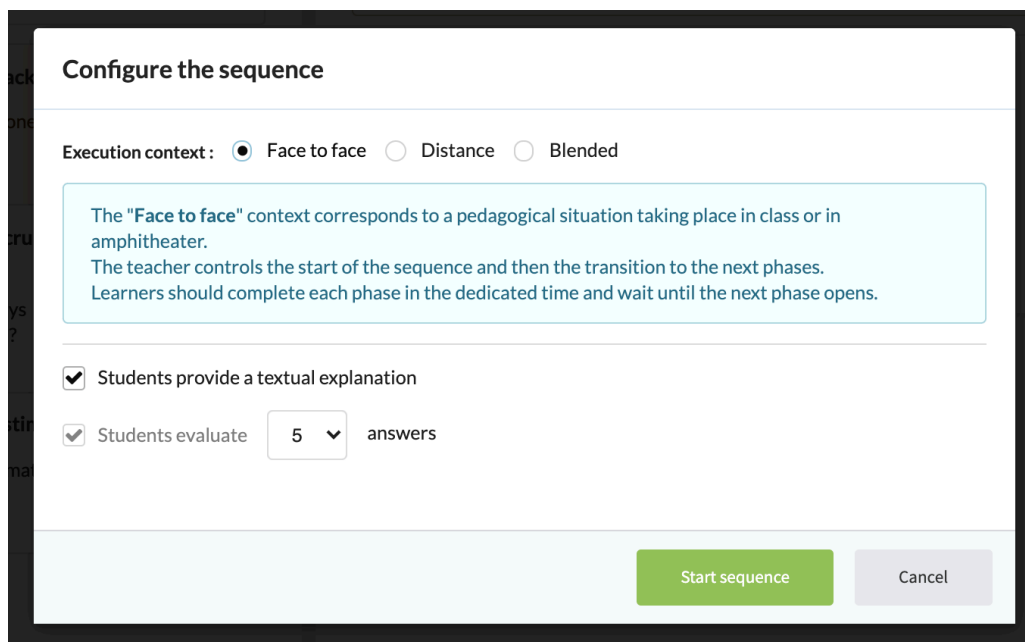


Figure 4: Elastic - Configuration of a sequence.

The teacher gives access to the assignment by providing a dedicated URL to his/her students or by creating an Elastic activity in a Learning Tools Interoperability (LTI) compliant Learning Management System (LMS).

From the beginning to the end of the sequence, the teacher has an interface allowing him/her to follow the progress and productions of the learners (Figure 1).

As a learner

Elaastic allows students to register an assignment by clicking a dedicated URL or an activity link in a learning management system.

Once registered, students can participate in any sequence started by the teacher. The first phase consists in answering the question providing a written explanation (even in case of closed question). They also indicate their confidence degree on the answer they provided (Figure 5).

The screenshot shows the user interface of the Elaastic application. On the left, a sidebar contains navigation icons and a list of activities under the heading "Decision making and rationality". The main content area is divided into two columns. The left column shows a list of activities, with the first one selected: "1. Reinforcement of the fuselage of World War II aircraft". Below this, a brief description of the activity is provided. The right column displays the details of the selected activity. At the top, there are three tabs: "Phase 1 Well-argued Response" (active), "Phase 2 Comparing viewpoints", and "Phase 3 Results". Below the tabs, a progress indicator shows "The phase 1 is in progress...". The main content area contains the question: "Reinforcement of the fuselage of World War II aircraft [EXCLUSIVE CHOICE QUESTION]". Below the question is a diagram of a biplane with red dots indicating damage on the fuselage and wings. The text below the diagram reads: "During the Second World War, a study examined the damage done to aircraft that had returned from mission. Engineers used this information to add armor on some areas of planes. Which areas do you think were reinforced?". Below the text are three multiple-choice options: "1. Areas most damaged.", "2. Areas least damaged.", and "3. No areas because the information did not allow to conclude on the areas to be reinforced.". Below the options is an "Answer" section with a text input field and a "Please submit your answer" button. Below the input field are three radio buttons for selecting an answer: "1", "2", and "3". Below the radio buttons is a "Textual answer" section with a rich text editor. Below the rich text editor is a "Confidence degree" section with four buttons: "Not confident at all", "Not really confident", "Confident" (selected), and "Totally confident". Below the confidence buttons is a green "Submit" button.

Figure 5: Elaastic - Phase 1 allowing student to answer a question and to indicate his/her confidence degree.

During the second phase, students are invited to give their level of agreement on some answers (max 5) given by other students. For closed questions, this peer evaluation can lead them to change their choice in case a rationale convince them to do so (Figure 6).

Figure 6: Elastic - Phase 2 allowing student to provide his/her level of agreement on peer contributions and to eventually change their answer.

At the end of this formative evaluation sequence, teacher and students are provided with a feedback generated by the system : in case of a closed question, an histogram showing the distribution of votes after the first and the second phase is presented to the audience with the list of rationales ordered by level of agreement. This feedback serves as a base for a final discussion between teacher and students on the current question (Figure 7).

The screenshot displays the Elastic platform interface. On the left is a navigation sidebar with icons for home, documents, and user profile. The main content area is titled "Decision making and rationality" and contains two items: "1. Reinforcement of the fuselage of World War II aircraft" and "2. Prise de décision et rationalité". The first item is selected and shows a text description: "During the Second World War, a study examined the damage done to aircraft that had returned from mission." The right-hand panel shows the activity's progress through three phases: "Phase 1 Well-argued Response", "Phase 2 Comparing viewpoints", and "Phase 3 Results". The "Phase 3 Results" section is active, showing a message "The sequence is closed." and a question: "Reinforcement of the fuselage of World War II aircraft [EXCLUSIVE CHOICE QUESTION]". Below this, a "My results" section shows a choice of 2 (marked with a checkmark), a score of 100%, and a feedback message: "As the planes got back from mission, the damaged areas were solid enough to prevent the crash so the other areas have to be reinforced." A "Results" section features a bar chart titled "Distribution of votes" with three tabs: "Confidence degree (phase 1)", "Peer evaluation", and "Peer evaluation". The bar chart shows the percentage of voters for each choice: Choice 1 (22%), Choice 2 (44%), Choice 3 (22%), and Choice 4 (11%). Below the chart, there are two feedback messages with evaluation counts: "5/5 3 evaluations" and "4/5 5 evaluations".

Figure 7: Elastic - Phase 3 provides student with personalised and global feedback.

How to start

The simple way to start using **Elastic**, as a teacher, is to create an account on the [platform hosted by IRIT](#) (GDPR compliant) and to test some sequences using the anonymous option when creating a sequence (thus students don't have to create an account).

For a more systematic usage, it is possible, by contacting us, to get an LTI token in order to use **Elastic** as an external tool of your LMS. In this case, teachers and students don't need to create an account on **Elastic** since it will be created on the fly when launching for the first time an **Elastic** activity from the LMS.

Finally, as an open source software, **Elastic** can be retrieved to be deployed on any server of any institution.

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References

- Andriamiseza, R., Silvestre, F., Parmentier, J.-F., & Broisin, J. (2021a). Data-informed decision-making in TEFA processes: An empirical study of a process derived from peer-instruction. *Proceedings of the Eighth ACM Conference on Learning@ Scale*, 259–262.
- Andriamiseza, R., Silvestre, F., Parmentier, J.-F., & Broisin, J. (2021b). Recommendations for orchestration of formative assessment sequences: A data-driven approach. *European Conference on Technology Enhanced Learning*, 245–259.
- Andriamiseza, R., Silvestre, F., Parmentier, J.-F., & Broisin, J. (2021c). Vers la conception de feedback pour enseignants dans un contexte d'évaluation formative à grande échelle: Une approche analytique. *10e Conférence Sur Les Environnements Informatiques Pour l'apprentissage Humain*, 46–57.
- Crouch, C. H., & Mazur, E. (2001). Peer instruction: Ten years of experience and results. *American Journal of Physics*, 69(9), 970–977.
- Silvestre, F. (2015). *Conception et mise en oeuvre d'un système d'évaluation formative pour les cours en face à face dans l'enseignement supérieur* [PhD thesis]. Université de Toulouse, Université Toulouse III-Paul Sabatier.
- Silvestre, F., Vidal, P., & Broisin, J. (2015). Reflexive learning, socio-cognitive conflict and peer-assessment to improve the quality of feedbacks in online tests. *European Conference on Technology Enhanced Learning*, 339–351.
- Silvestre, F., Vidal, P., & Broisin, J. (2017). Un nouveau processus d'évaluation pour améliorer la qualité des feedbacks dans les tests en ligne. *Sciences Et Technologies de l'Information Et de La Communication Pour l'Éducation Et La Formation*, 24(spécial), 181–203.