

Digital Formats of Learning Outcomes Assessment in the COVID-19 Paradigm: Survey Study

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ABSTRACT

The global pandemic and emergency digitization measures have introduced systemic challenges to the university summative and formative assessment workflow. Various modes of assessment for University-level programs are a strict regimen that consists of different elements and stages (oral, hybrid, and written exams, tests of different types, project presentations, internal and external review, expert evaluation, and peering). This study aims to critically analyze the practices of Borys Grinchenko Kyiv University in various forms and modes of digital assessment for stakeholders of Liberal Arts, Education, and Computer Science major programs, implemented in the years 2020–2021 through quarantine induced digital learning. The survey analysis was conducted to evaluate ICT tools and digital competencies that are implemented to compare and contrast traditional and formative assessment practices, translated into the digital hybrid format. The investigation novelty is attained through systemic empirical findings on experiences and techniques of learning outcomes assessment in the emergency digitization measures, contrastive assessment of different modes in digital learning, evaluation of ICT tools and skills, implemented through different forms of assessment in the digital learning context.

CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in collaborative and social computing**;

KEYWORDS

ICT Tools, Summative Assessment, Formative Assessment, Digital learning, Digital literacy

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1 INTRODUCTION

Comprehensive factors of social transformation (globalization, digitization, development of a new media ecology [6]) highlight the development of various types of meaningful networking structures in the knowledge economy: knowledge networks, professional networks and networked society overall [19]. Subsequently, networked society as a global institution in the knowledge economy context calls for the implementation of networked education.

The topical need to revisit and reexamine the established models of education and, subsequently, assessment, arises from the changes that networked societies experienced due to the global pandemic COVID-19.

The global pandemic and emergency digitization of all socio-economic spheres presented a range of challenges to the structure, procedure and efficiency of learning institutional operations and assessment procedures, subsequently [15, 17]. In the educational sphere, the result of the COVID-19 pandemic digitization measures and protocols resulted in the transformative shift along the following functional avenues:

- adaptation of the educational formats to digital, blended or hybrid modes;
- activation of hard and soft skills, latent or underdeveloped in digital learning in the timespan preceding the quarantine measures;
- breakthrough in improvement of digital competence for different educational activities, procedures and scenarios, involving all groups of stakeholders of the higher education.

In view of the combination of the delineated factors of educational practice digital adaptation, the inquiry overarching **objective is to profile and evaluate the practices of two contrastive modes of learning outcomes assessment in higher education (traditional and formative) as implemented in the timeframe of emergency digital learning measures of 2020–2021** at Borys Grinchenko Kyiv University.

2 STATE-OF-THE-ART OVERVIEW

In the current pedagogical paradigm, there are distinguished three core functional assessment modes in education [5, 10]:

- **Assessment for the purpose of learning** is a practice of application of students' progress report to inform a teaching strategy and workflow.
- **Assessment as a form of learning** is a practice of reflection and monitoring of progress by students proper to shape learning goals.
- **Assessment of learning as an object** is an evidence-based practice of application of learning efficiency data to measure achievement against learning goals and institutional standards.

Assessment for the purpose of learning is formative in nature and is instrumental to integrate assessment into the educational process by establishing the teacher's leading role in assessment [22]. Assessment for learning is unidirectional and hierarchal. Assessment as a form of learning is formative in nature as well and facilitates establishment of the students' roles and responsibilities in the educational progress benchmarking. Assessment as learning is collaborative, multidirectional and equipollent.

Assessment of learning as an object is summative in nature and facilitates the measurements of learning goals feasibility and learning outcomes efficiency [5].

Assessment of learning is institutional and standardized.

The COVID-19 crisis brought the new Digital Education Action Plan into focus, where issues like the digital readiness of education and training institutions, teachers' digital competences and the design and implementation of online learning, the creation of a digital education ecosystem were increasingly identified as pressing to be tackled at European level [4]. The results of the OPC contributed to contextualising the extent of digital technologies use for education and training during the crisis. The majority (66.6%) of consulted groups reported that the use of distance and online learning had increased during the crisis [14, 18].

Digital learning implementation challenges in universities in the time of COVID-19, as estimated by the authorial group through continuous observation [14, 16] and benchmarking include the following:

- lack of a single distance learning platform – LMS
- unpreparedness of teaching staff for distance learning
- unpreparedness of teaching staff for distance learning
- lack of understanding of the purpose of digital tools for the effective implementation of educational activities
- academic integrity (of teachers and students)
- misunderstanding of changes in educational activities in distance learning
- there is no support for teachers and students
- insufficient communication, collaboration and cooperation between students and teachers
- lack of time

As one of the key institutional elements of the educational workflow, the assessment of learning outcomes and measurable learning goals in all its forms is subject to transformative shifts and challenges in skills (soft and digital) [16], ICT tools and implementation practices, due to the emergency digital learning measures in higher educational institutions (figure 1, 2).

As is evident (figure 2), the typology of assessment activities undergoes qualitative transformation, enhanced by the emergency

digital learning measures, in terms of techniques, that serve as digital equivalents to real-time educational practices, for measurable evaluation of performance results and competence formation on each tier of learning goals achievement.

3 METHODOLOGY AND DESIGN

The design of the inquiry methodology is based on the mixed method approach (correlation of qualitative profiling and quantitative evaluation of a phenomenon) and comprises of a combination of consecutive steps:

- (1) Assessment of learning outcomes (summative and formative) activity, experience and application profiling in the digital learning context;
- (2) The online survey method, that combines mixed media surveys [7], was implemented to evaluate and compare experiences and practical application of digital assessment by different groups of educational process participants;
- (3) ICT tools and relevant types of skills for different modes of assessment evaluation, tailored to the overall context of education modernization via digitization and stakeholders' target group needs.

Based on the activity profile (assessment of learning outcomes) a survey was conducted among the stakeholders of higher education process – in-service educators and senior year students (pre-service educators) of Liberal Arts, Education and Computer Science programs.

The survey consists of 14 questions of multiple choice and Likert-scale scoring types, that were aggregated into 3 groups, corresponding to the following dimensions of inquiry:

- (1) Overall experiences and techniques of learning outcomes assessment in the emergency digital format;
- (2) Comparison and contrast of traditional and formative assessment in the digital learning context;
- (3) ICT tools and skills, implemented through different forms of assessment in the digital learning context.

A sizable sample of 188 respondents total took part in the survey.

The study qualitative profiling of assessment activities is based to the generic structure of Higher education technology landscape 2020 [1], that features such elements as: institutional IT infrastructure; admissions and enrollment management; ICT tools for performance assessment; ICT tools for student distinction. The inquiry qualitative premise furthermore incorporated various approaches to digital literacy structuring, based on the actual frameworks of 21st century skills [8, 9, 20, 21] for educational purposes and profiled digital literacy requirements in the educational and civil service spheres:

- (1) UNESCO Framework [2] is based on the core ICT competence principle: the ability to help the students to apply soft (communicative) skills through the use of information and communication technology so they will be effective as future educators.
- (2) Liberal Arts ICT competence profile, generated through the toolkit of the European e-competence framework guideline [3] includes the following key components:

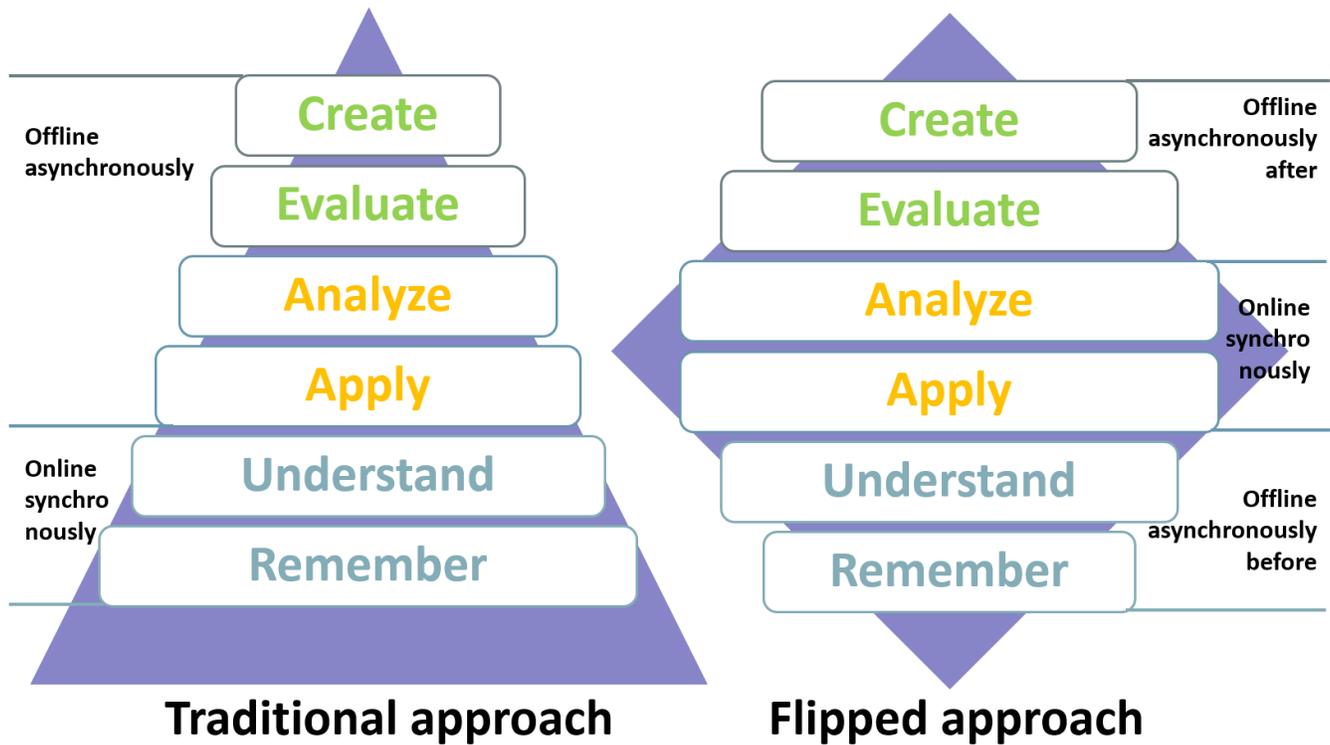


Figure 1: Revised Bloom's Taxonomy of Educational Objectives in the online format [12].

- training to attain institutional and vocational standards of ICT competence in technical sphere or in business;
- analyzing skills gaps;
- defining and implementing an institutional training policy in ICT to bridge the existent gaps in skills.

(3) Digital Competence 2020 framework consists of 5 core parameters assessed according to proficiency [11]:

- Information and data literacy;
- Communication and collaboration;
- Digital content creation;
- Safety;
- Problem-solving.

4 TECHNIQUES OF LEARNING OUTCOMES ASSESSMENT IN THE DIGITAL LEARNING FORMAT: SURVEY STUDY

Dimension 1 of inquiry (disclosed through Group 1 of questions) – overall experiences and techniques of learning outcomes assessment in the emergency digital format- provided the following scope of qualitative and quantitative results.

The proportional number of respondents predominantly implemented both formats of assessment in the emergency digital learning context (regular assessment – 78.7% of respondents, formative assessment – 57.4% of respondents). In the COVID-19 emergency digital learning format, the following way of assessment have been implemented by the sampled respondents (figure 3):

- Blended assessment format (synchronous and asynchronous) – 85.1% of respondents;
- Asynchronous electronic format of assessment (preparation of tasks in the LMS Moodle and their grading later) – 12.8% of respondents.

The changes in the workflow and procedures of assessment have been dynamically evaluated by the stakeholders in the following way (figure 4):

- 56,4% of respondents (overwhelming majority) testify that there was a transition to the use of alternative tools for assessing students (for example, the use of open-end tests, instead the use of testing with closed-ended questions or an oral interview, etc.)
- 28.7% of respondent believe that assessment technologies have changed (educators use more formative assessment techniques or, conversely, more regular techniques, but in the electronic form)
- 9.6% of respondents see no changes in the assessment strategies and techniques.

89% of respondents estimate, that the time spent of assessment procedures of any form in the emergency digital learning format has been overall increase, thus postulating the digital environment and enhanced digital literacy requirements to be the core challenges to implement both regular and formative assessment types.

Dimension 2 of inquiry (disclosed through Group 2 of questions) – comparison and contrast of traditional and formative assessment

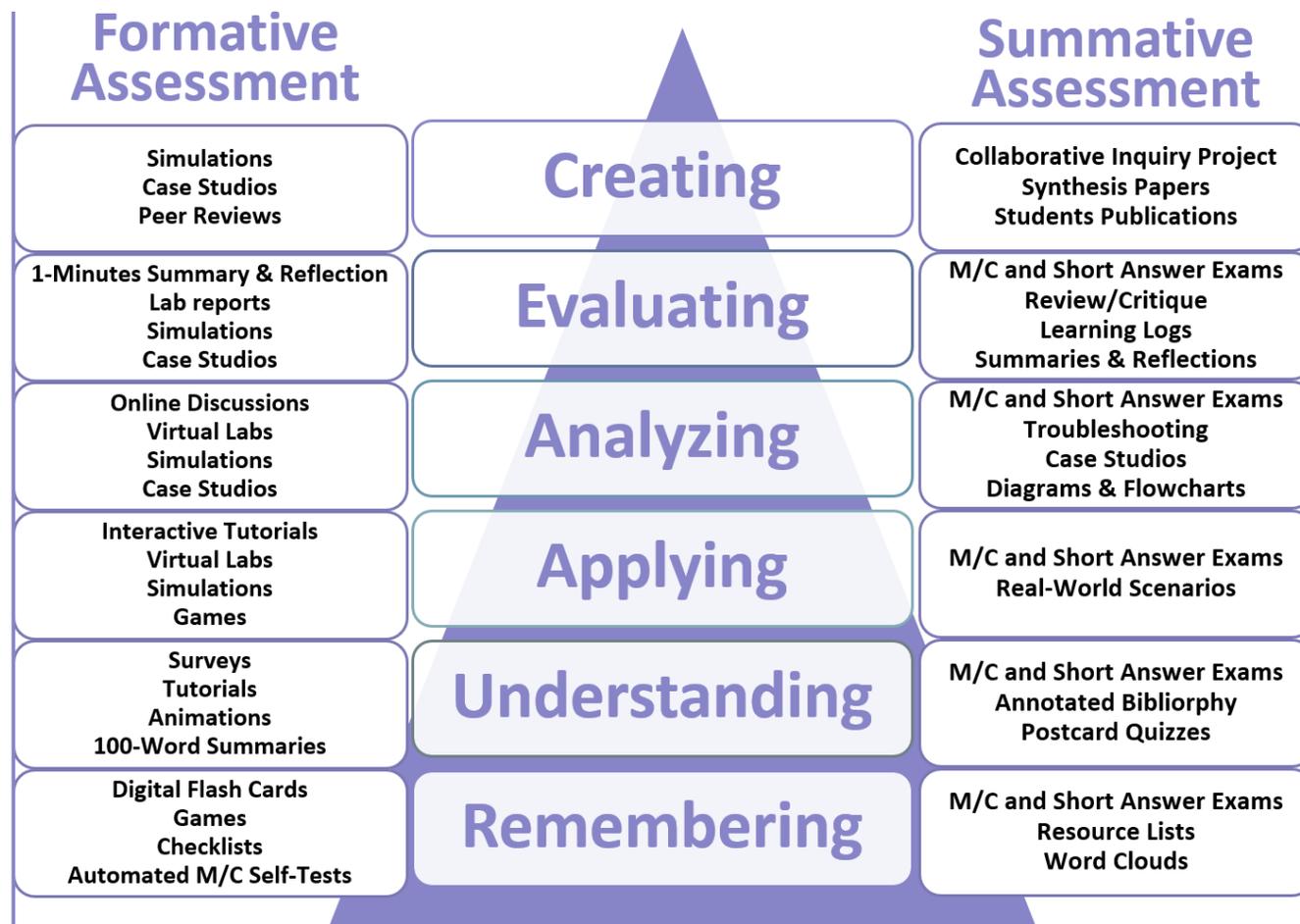


Figure 2: Assessment Activities in the Online Format According to Revised Bloom's Taxonomy of Educational Objectives [13].

in the digital learning context – provided the following scope of results.

Qualitatively, regular and formative assessment are compared through the following key dimensions:

- (1) Subject matter or learning content;
- (2) Type of activity or technique;
- (3) Subject, who performs the assessment

Subsequently, regular assessment incorporates the following core parameters:

- subject mastery assessment
- assessment by a teacher/professor

Whereas, formative assessment incorporates such core parameters:

- peer assessment, self-assessment
- project assessment
- individuality and collaboration assessment
- full mapping of learning
- learning trajectory identification
- reflection

Subsequently, the following dominant techniques of regular assessment in the digital format are estimated by the stakeholders:

- Tests (87.2% of respondents);
- Practical task (83.5% of respondents);
- Oral answer/interview (80.3% of respondents);
- Written answer/essay (74.5% of respondents)

The priority techniques of assessment, customized for formative type, in the digital format are estimated by the stakeholders as follows:

- Educational workflow assessment by the professor with the help of special tools (checklists and assessment criteria dimensions) – 68.1% of respondents
- Peer-to-peer assessment by students (49.5% of respondents);
- Self-assessment by students (48.4% of respondents)

Quantitatively, the major advantages of regular assessment techniques, implemented in the digital distant format are estimated by the survey respondents to be:

- Evaluation tasks by a professional expert – 6% of respondents;
- Verification of the learning proficiency – 58% of respondents;

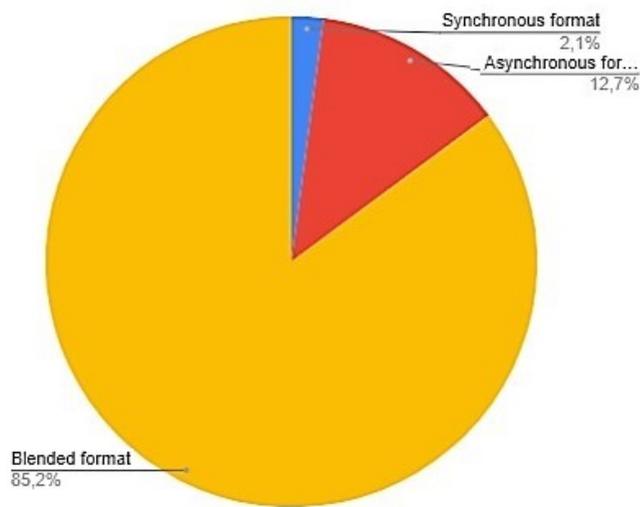


Figure 3: Formats of assessment implemented in digital learning.

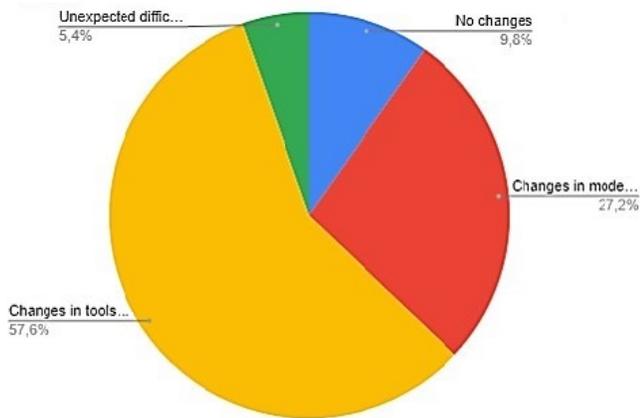


Figure 4: Changes in the assessment workflow in the COVID-19 context.

- Precise identification of errors that provides for learning from one’s own mistakes – 57% of respondents.

In comparison, the major advantages of formative assessment techniques in the digital distant format are estimated by the survey respondents to be:

- Possibility to detect generic mistakes through peer-to-peer analysis – 71% of respondents;
- Amplified transparency of assessment – 60% of respondents;
- Inspiration, derived from the peer-to-peer assessment to improve one’s own workflow and progress – 6% of respondents;
- Increased motivation for collaborative efforts in learning – 58% of respondents.

Dimension 3 of inquiry (disclosed through Group 3 of questions) – questions on ICT tools and skills, implemented through different

forms of assessment in the digital learning context – yielded the following results across the board.

The respondents assessed a wide array of ICT tools, implemented in digital learning workflow for the purposes of regular and blended assessment (figure 5).

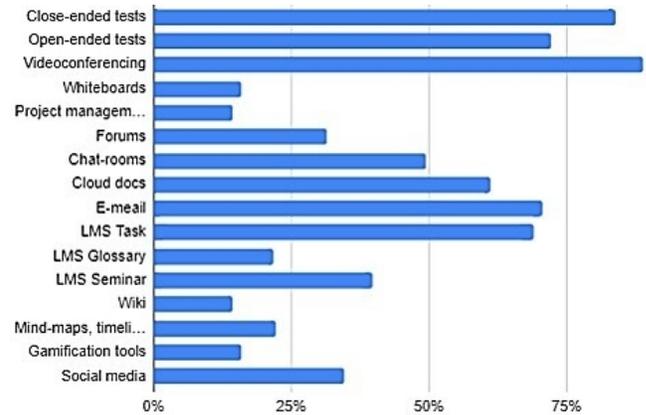


Figure 5: Digital tools for assessment.

The priority ranking digital tools for assessment, implemented across different educational programs in the COVID-19 measures and incorporating both regular and formative assessment modes was estimated to be as follows:

- Videoconference meetings (895 of respondents);
- Close-ended online test questions (84% of respondents);
- Open-ended online test questions (72.3% of respondents);
- E-mail (70.7% of respondents);
- Google documents (71% of respondents);
- LMS Moodle ‘Task’ (69.1% of respondents)

In contrast, the dominant ICT tools and services, customized for formative assessment in digital format were estimated as follows (figure 6):

- Questions, that guide the learning workflow (outline questions) – 66% of respondents;
- Criteria checklists and tables (64% of respondents);
- Reflection (via online synchronous and asynchronous means) – 60.1% of respondents;
- Online project assessment and online feedback surveys (43.6% of respondents).

As the survey data results have indicated (Group 1 of questions) – the digital format proper and the necessary use of online and hybrid tools for assessment purposes inevitably pose a challenge of activation of an array of soft skills, necessary to carry out the required assessment techniques successfully.

Qualitatively, the following soft skills, across different relevant frameworks, necessary for efficient assessment were estimated: communication, collaboration, team-work, time-management, research, digital literacy, project management, learning and innovation. Quantitatively, the following soft skills are assessed as dominant for regular assessment in the digital format:

- Communication (83% of respondents);

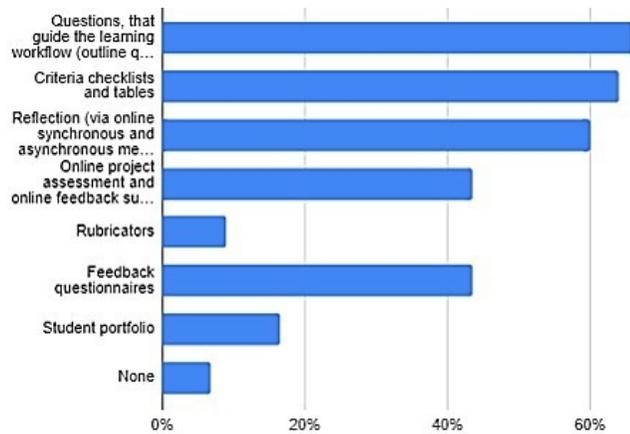


Figure 6: Digital tools for formative assessment.

- Learning (73% of respondents);
- Time-management (66% of respondents);
- Research (65% of respondents).

In comparison, the dominant soft skills, customized for efficient formative assessment in the digital format are estimated as follows:

- Innovation (84% of respondents);
- Digital literacy (80.1% of respondents);
- Collaboration (80% of respondents);
- Project management (79.2% of respondents).

Overall the survey data testifies, that the implementation of formative assessment in the digital learning format activated a set of soft skills, distinctly different from the one needed for efficient regular assessment techniques and procedures in the digital format.

The soft skills, that are estimated as equipollent and proportionally relevant both for regular and formative types of assessment in the digital format are as follows: capacity for learning (average of 73.4% of respondents); communication (74.7%); research (68.3% of respondents).

It bears notice, that soft skills, required for formative assessment are process oriented, whereas soft skills, required for regular assessment are result and subject oriented.

5 CONCLUSION

Assessment procedures (regular/summative and formative), implemented through different types of educational activities for different types of educational programs at Borys Grinchenko Kyiv university have been efficiently adapted to digital and hybrid learning through the implementation various ICT tools and techniques in the timespan of the COVID-19 emergency measures. The consistent benchmarking of summative and formative assessment techniques in the digital learning environment can provide a best practice model for other universities of Ukraine and countries of the world. Digital assessment format is a measure to increase learning efficiency in the context of a prolonged lockdown. It serves as an efficient vehicle of democratization of education in the digital age.

The survey results conducted among stakeholders of the learning outcomes assessment for Liberal Arts, Education and Computer Science programs have yielded conclusive data as to the comparative efficiency of different types of assessment in the digital format, as well as the adaptability of various digital tools for assessment scenarios. The qualitative evaluation of assessment experiences in the digital format confirmed that across different study programs, implementation of assessment activities and practices with the help of ICT tools demands intermediate digital literacy of educational stakeholders. Application of learning management systems for different facets of assessment procedures calls for advance to intermediate digital literacy and points to the existent gap in technical skills of educators in high-stress, emergency digitized environment.

The following recommendations can be derived for the successful implementation of the formative assessment techniques and tools in the digital learning format:

- Assessment through discussion requires implementation of such ICT tools and services as online learning materials / manuals, email discussions and messengers, discussion groups, discussion forums, whiteboards, web conferencing tools – synchronous and asynchronous;
- Assessment through inquiry requires implementation of such ICT tools and services and practices as use of online information and recommendations, analysis of ideas and information in various digital resources, use of digital tools for data collection and analysis, comparison of digital texts, use of digital tools for search and evaluation of information and ideas;
- Task-based assessment requires implementation of such ICT tools and services and practices as use of modeling, micro worlds, online simulators, virtual laboratories and excursions, role-playing games online;
- Assessment through product development requires implementation of such ICT tools and services and practices as creation and storage of digital documents, presentation of projects, performances, artifacts, cartoons, models, resources, slide shows, photos, videos, blogs; e-portfolio;

The results of this inquiry can be further elaborated in evaluation of digital tools efficiency and applicability of digital skills for different groups of assessment activities participants (educators, students and administrative staff). The combinatory modes of assessment in digital learning environments of different degrees of complexity has the potential to be further investigated for separate types of university programs (Liberal Arts and STEM).

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