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Quality in online delivery: what does it mean for assessment in e-learning environments?

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QUALITY IN ONLINE DELIVERY: WHAT DOES IT MEAN FOR ASSESSMENT IN E-LEARNING ENVIRONMENTS?

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Abstract

While a great deal has been written on the advantages and benefits of online teaching, and research continues to proliferate, many practitioners are seeking guidelines that can be applied to the design of assessment in online environments. The last decade has seen the convergence of traditional distance education with on-campus modes of delivery and work-based training signalling new models of flexible delivery. In addition, demand driven education accentuates the learner's role and needs while the teacher has become a manager, mediator and motivator of student learning. Issues raised by national and international bodies and quality assurance agencies now seem to be addressing the same questions. How can a teaching and learning process that differs so markedly from what has been practiced for hundreds of years maintain and support quality? Who will be the guardians of quality and the innovators of learning and assessment design?

This paper addresses current definitions of quality in online assessment and examines emerging expectations of what constitutes appropriate online assessment. A case study is presented of a Web-based assessment framework that is both interactive and product-oriented and involves learners in making contributions to course resources through learning activities. It is proposed that an interactive-participatory model of assessment utilises the communicative features of technology while affording a motivating and authentic assessment experience.

Keywords

assessment, e-learning, higher education, quality

Introduction: The Quality Debate

A number of reports and documents provide design guidelines and benchmarks for distance education environments. For example the Institute for Higher Education Policy (National Education Association, 2000) provides 24 benchmarks for course design, delivery and learning outcomes. In their report no specific recommendations are made except to suggest that intended learning outcomes are regularly reviewed to ensure clarity, consistency and appropriateness. Penn State University in association with Lincoln University (Innovations in Distance Education, 1999) have taken this a step further and promote that "where possible provide assessment and measurement techniques and options that capitalise on the unique characteristics and situations of the distance learner". Recommendations on assessment processes are as follows:

- Enable students to self-monitor progress;
- Give regular feedback to students;
- Support peer learning and assessment;
- Design self-assessment practices.

These recommendations are in line with those of Berge, Collins and Dougherty (2000) who also suggest, with respect to online learning, that "wisdom might be served by using alternative forms of assessment of student understanding". One example they cite is the use a series of sequential exercises building upon one another throughout a semester, so that issues of security are less of a problem. However, in all the reports cited here, there is a dearth of pedagogical guidelines for practitioners. The Quality Assurance Agency for Higher Education (1999) acknowledges that there are differences in the way assessment is conducted on campus that may not be appropriate for students studying in the off-campus mode, who have little contact with academic staff. In another study Warren and Rada (1999) address the issue of quality learning via computer-mediated communication. They define quality learning as going beyond the acquisition of facts to achieving a cognitive outcome, and fostering higher order thinking at the level of synthesis and evaluation of concepts.

Is Quality a Matter of Design?

Others argue that no single design or perspective is adequate for the design of technology-enhanced learning environments (Sfaard, 1998). The same message about multiplicity comes from Spector (2000) who notes "technology has yet to make significant improvements in the quality of education by any reasonable measure" (p. 243). Spector continues to argue that most failures can in fact be attributed to the belief that there is one best approach, one perfect theory or one final solution. The McKinnon Report (McKinnon, Walker & Davis, 2000) provides a student satisfaction benchmark that monitors student ratings of their learning experience and overall satisfaction with assessment based on the Course Experience Questionnaire (CEQ) administered when students have graduated. Data coming from the CEQ only measure satisfaction with existing assessment arrangements, but do not provide any indicators of quality beyond student satisfaction. Teachers and designers need a principled basis for designing new forms of assessment, closely aligned with instructional goals and utilising the interactive features of online technology (American Psychological Association, 1993). If we acknowledge that assessment drives student learning, it is likely that it will remain at the centre of the curriculum design process, and will be central in the student learning experience (Ramsden, 1992; Biggs, 1999).

We may conclude from this overview of the quality assurance debate that the notion of quality defined in terms of student satisfaction with assessment processes is important, yet few guidelines have been provided by academics on what practices to adopt when designing educative, authentic or valid assessment processes that are suited to distance education and online environments. Most often, quality issues are tied up with implementation, infrastructure and delivery of services to students and they provide a big picture view of the systems that need to be in place to enable assessment to be managed at an institutional level. Collis and Moonen (2001) propose a four-dimensional model that incorporates technology adoption, implementation, pedagogy and institutional planning that combine to influence the quality of teaching and learning that occurs.

Are there Opportunities for Improved Assessment Practices on the Web?

Information and communication technologies (ICT) have the capacity to support a wide range of learning goals and are now integrated into teaching approaches of many higher educational institutions. Laurillard (1993) suggests that computer-based learning has a major role in promoting:

- self-directed learning and increased student autonomy;
- flexibility and diversity in assessment;
- increased information literacy, ensuring that graduate skills are in tune with those of employers; and
- increased productivity and efficiency in higher education.

Similarly, Alexander and McKenzie (1998) reviewed 104 projects relating to innovative technology adoption and found that students had improved attitudes to learning, improved access, and improved opportunities to interact and develop information literacy. However, opportunities for learning do not always translate into learning outcomes. Alexander and McKenzie (1999) also reviewed student perceptions of technology and the value of ICT for learning. The major findings were as follows:

- Student perceptions of technology are a major influence on their attitude and approach to learning. Will they earn extra marks for using technology? Will it be counted in their grades? In designing a course, this might mean evaluating student contributions to a bulletin board as part of the formal assessment process.
- Often students' experiences of working in groups is one of frustration, despite claims that technology is bringing about peer relationships and better communication.
- Students' prior experience of teaching and learning influences their acceptance of new learning approaches, whether these are with or without technology.
- Students do not feel that quantifiable learning gains are always achieved from technology use.

Given these results and the additional finding that ICT adoption did not bring about pedagogical change in the Alexander and McKenzie (1998) report, Collis and Moonen (2001) conclude that while learning gains cannot be proved, they still remain optimistic about technology integration. They contend "what can be claimed at a general level is that students experience new forms of learning, that instructors are making new types of contacts with their students and that new resources and types of learning activities are occurring". Other researchers would say that what determines the educational value of ICT is how it is used in practice (Schacter, 1999). Whether these new learning activities have arisen out of new curriculum approaches and can lead to innovative assessment practices is a matter of importance to online educators and instructional designers.

Web-based Learning: Does it Mean New Pedagogy or Just Repackaging?

The shift to student self-direction and autonomy means that students need to take more responsibility for their own learning, but many need assistance in achieving this skill. Shaffer and Resnick (1999) maintain that technology can be used to create authentic contexts for learning, and provide resources that give students opportunities in a number of areas:

- connectivity: to connect to the world outside the classroom, to research topics that would otherwise be inaccessible, to access experts and to engage in conversations with peers;
- authenticity: to demonstrate performance in authentic tasks and communicate events;
- epistemological pluralism: to express and represent ideas in many different ways.

Applied to assessment, representational pluralism enabled by computer technology expands the range of channels available to students to demonstrate understanding (Gardner, 1993; Greeno & Hall, 1997). For example, instead of using narrowly defined learning outcomes tested by examinations, technology offers a total environment where real life skills, such as written and verbal communication, collaboration and team work can be assessed by giving learners multiple channels of expression, such as visualisation and multimedia. Thus, information technologies can change the quality of the learning experience, and can be used to create authentic environments for assessment.

Terms used to describe the impact of ICT in higher education are many: flexibility, learner-centeredness, Rich Environments for Active Learning (REALs), anchored environments, mediated learning, cooperative learning and global classrooms (see Abbey (2000) for a complete overview). Yet how many of these are *new designs* as opposed to just *new terms* for learning? Russell (1999) claims that despite all these innovations, no significant differences have emerged for learning outcomes in technology supported environments. While it is claimed that the Web does offer new opportunities for learning activities, assessment practices must be reframed and reconsidered as part of a holistic approach to curriculum design and pedagogy.

Collis and Moonen (2001) use the term *pedagogical re-engineering* to describe the change in online pedagogy from one that is teacher centred to one that is focussed on learner activity. Pedagogical re-

engineering is based on the premise that courses are built up of components or units of instruction that are bound together in sequences or combinations. By introducing technology and Web-based learning, these components can be changed and made more flexible and student-centred, thus leading to course enhancement through the adoption of learner-centred pedagogies and new forms of assessment.

Does Web-based Learning also Mean New Conceptions of Curriculum?

A key element in pedagogical re-engineering is the use and application of media to teaching and learning scenarios where students are active participants and contribute actively by generating knowledge. By changing roles and by enabling students to make contributions towards learning resources, assessment also becomes more learner-centred and performance-based. For example, in some activities students can post new URLs to the course site so that others can share and critically evaluate them, and these resources become part of the learning activity. Similarly, the move towards peer assessment is an indicator of pedagogical extension via the Web, as online communication tools, shared workspaces and asynchronous dialogue make networked learning and assessment feasible. This participatory/contributions-oriented approach to learning can be summarised as follows:

- Assessment activities recognise students as contributors;
- Assessment activities involve opportunities for students to communicate, contribute to, and participate in an online community;
- Assessment activity reflects the status of students as contributors to course content, and creators of new knowledge products.

It is certainly the case that online technologies and Web-based learning have led to a reconceptualisation of learning, pedagogy and assessment. This is reflected in the various theories of learning, which emphasise learning activity, participation in communities of learning, engagement theory and the contributions-oriented student model proposed by Collis and Moonen (2001). Table 1 summarises the notion of the active, participatory student and its implications for pedagogy.

	Contributing student model (Collis & Moonen, 2001)	**Participation oriented learning (Sfaard, 1998)**	**Engagement Theory (Kearsley & Schneiderman, 1998)**	**Constructive alignment model (Biggs, 1999)**
Definitions of learning	Learners contribute to the course via Web-based tools	Participation, member of a community	Meaningful activity with others and interaction through worthwhile tasks	Emphasis on student activity
Learning outcomes	Product-oriented, focussed on peer learning, sharing and collaboration	Belonging, participating, communication, lifelong learning	Higher order thinking, team work and generic capabilities that include information literacy and global perspective	A well structured knowledge base, interaction with others
Key activities	Preparation before class, activities during class, review and self assessment after class	Apprenticeship, communication, participation	Team work, interactive learning, peer learning	Teacher-directed, peer-directed and self-directed activity
Curriculum process	Reusable learning objects and resources are created by students	Negotiated; student as participant	Needs-based, project-oriented, authentic	Align teaching methods, assessment and student activity
Teacher role	Design activities for maximum student participation	Facilitator, mentor	Coaching of project based learning	Maximise structure, offer scaffolding, foster self-direction

Table 1: Summary of key features - Student as Participant (based on Collis and Moonen, 2001))

The 'student as participant approach' is enabled by Web-based technology, which gives students access to learning resources, communication tools, databases and asynchronous networks. These models of learning accentuate the movement away from transmission-oriented approaches and towards active learning where the student generates products and resources that can be re-used and shared with others. This approach can be applied to assessment, so it becomes less teacher-dominated and more flexible, with more autonomy and responsibly given to the student. For example, peer and self-assessment activities offer scope for learners to assume the roles of critical participant and contributor, while creating online portfolios can allow students the scope to share ideas and to engage in peer review.

Alternative Assessment Using Technology

In recognition of the limitations of traditional university assessment, there is a new wave of pedagogy advocating 'alternative assessment' in which assessment is integrated with learning processes and real-life performance as opposed to display of inert knowledge (Wiggins, 1998). This form of authentic assessment is solidly based on constructivism, which recognises the learner as the chief architect of knowledge building.

In constructivist learning environments there is social interaction, communication, exchange of views, collaboration and support for learners to take more responsibility for the learning process through learner-centred tasks (McLoughlin & Oliver, 1998; Collis, 1998). Salient features of constructivist learning environments include an emphasis on the following aspects:

- *authenticity:* learning is located in actual contexts and linked to real tasks;
- *group work:* social interaction and feedback are instrumental in communication and higher order thinking processes;
- *learner control*: learners are active in defining and negotiating learning tasks; and
- *scaffolding learning*: learners are supported as they progress from novice learners to self-regulated experts.

Authentic or performance assessment can be effectively used in constructivist learning environments as it enables both process and product knowledge to be assessed, supported by communication channels for group work, reflection, higher-order thinking and self-directed learning (Scardamalia & Bereiter, 1992; Birenbaum, 1999; Reeves, 2000).

The use of the Web to support assessment offers greater adaptability and flexibility than traditional or objective assessment (e.g., based on discrete tests and multiple choice quiz items) as it enables the collection and storage of continuous data, and easily created micro-environments where learners solve real life problems. It can be argued that the move towards authentic assessment paradigms has been accelerated by technology with its capacity to cope with a broad array of activities, tasks and forums for collaboration, dialogue and student-centred learning. For instance, Kendle and Northhcote (2000) suggest a combination of qualitative and quantitative assessment tasks that use multiple modes of showcasing student achievement through portfolios, multimedia projects, skills demonstrations and teamwork. Table 2 contrasts some features of authentic assessment with standard objective assessment, and provides examples of how Web-based environments offer possibilities for authentic assessment tasks.

A further important contribution made by technology to authentic and performance-based assessment is the capacity to support learning processes such as communication, group work and collaborative problem solving. The following section present a case study demonstrating multiple forms of assessing student learning online, while maintaining a focus on learning processes and professional skills rather than content-based outcomes.

Objective assessment	Authentic assessment	Indicators of authenticity	Web-based support
Require correct responses only	Require quality product and/or performance, and justification.	Assess whether the student can explain, apply, self-adjust, or justify answers, not just the correctness of answers using facts and algorithms.	Allows students to articulate viewpoints in text-based conversation that can be archived as a learning resource.
Must be unknown in advance to ensure validity	Are known as much as possible in advance; involve excelling at predictable demanding and core tasks; are not gotcha! experiences.	The tasks, criteria, and standards by which work will be judged are predictable or known like a project proposal for a client, etc.	Web-based teaching allows access to multiple sources of information about the task, while allowing learners to explore alternatives.
Are disconnected from a realistic context and realistic constraints	Require real-world use of knowledge: the student must do history, science, etc. in realistic simulations or actual use.	The task is a challenge and a set of constraints that are authentic likely to be encountered by the professional.(Know-how, not plugging in, is required.)	The task is a challenge and can extend the confines of the classroom to involve complex, ill-defined tasks and collaboration.
Contain isolated items requiring use or recognition of known answers or skills	Are integrated challenges in which knowledge and judgment must be innovatively used to fashion a quality product or performance.	The task is multifaceted and non-routine, even if there is a right answer. It thus requires problem clarification, trial and error, adjustments, adapting to the case or facts at hand, etc.	Web provides access to information, databases and course notes. Learners have control.
Are simplified so as to be easy to score reliably	Involve complex and non-arbitrary tasks, criteria, and standards.	The task involves the important aspects of performance and/or core challenges of the field of study	Web-based learning provides multiple vehicles for showcasing student achievement, including portfolios and skills demonstrations.
Are one shot	Are iterative: contain recurring essential tasks, and learning processes.	The work is designed to reveal whether the student has achieved real versus surface mastery, or understanding versus mere familiarity, over time.	Web-based teaching enables gathering of continuous process data on student achievement.

Table 2: Elements of authentic assessment utilising the Web

Context of the Study

Final year students enrolled in the Interactive Multimedia course at Edith Cowan University are required to develop skills and expertise in managing the design and development of client web sites. The unit IMM 3228/4228 – "Project Management Methodologies", uses teams of four or five students to utilise their specialist skills to build an electronic portfolio. Team roles include programmers, graphic designers and project managers. There were 82 students completing this unit, which was delivered through a custom built web site to enable both internal and external students access to resources, and also to enhance the quality of the learning environment. Students negotiate a project topic with their tutor, which is aimed at meeting a "real need" for an industry or university client. Requirements include:

- significant contribution and participation to the development of a team-based multimedia project;
- a critical analysis of the project management of a team-based multimedia project;
- formative evaluation of the multimedia product; and
- an analysis of the intended implementation methodologies for that product; and, where relevant, a prediction of the organisational and cultural changes likely to result from the implementation of that product.

The aim was to have students experience project management issues that occur when dealing with "real" clients in "real" projects.

The Learning Environment and Task Design

The development of project management skills that are transferable to real world contexts means that learners have to assume more responsibility for their own learning, but many need assistance in achieving these skills. In this tertiary setting, the development of professional skills was linked to the creation of a project-based learning environment. Group-based project work was chosen for its relevance and congruence to the learning outcomes that were sought. Project work is advocated for its capacity to support professional expertise and vocational skills and has been successful as an instructional strategy in may contexts (Collis, 1998; Klemm & Snell, 1996; English & Yazdani, 1999). Learner activities were undertaken in groups and teams.

This style of problem-based learning involves a number of activities and tasks that appear to provide robust support for the development of a number of key skills. As shown in Figure 1, the activities that were designed included:

- To help gain commitment, students were required to complete an online "student contract" at the beginning of the semester, signed by themselves, their team members', and the tutor. The contract outlined students' responsibilities needed for developing the teams' web site and weekly tasks.
- Teams were required to complete problem-solving tasks each week, which required students to seek information from a variety of sources that reflected state-of-the-art knowledge about project management. Students used information provided through the online application, as well as the Web and had to select resources that were relevant to the task from the many that were available.
- Having solved the weekly problem, teams were required to apply inter-team assessment. They were required to assess other teams' solutions and defend the assigned marks with comments based on valid criteria. If students were unhappy with the results, they could make comments on the bulletin boards, asking for clarification from other teams or tutors.
- Each week students were required to perform intra-team assessment (Figure 2). Students assessed their own progress as well as their peers, giving confidential information to the tutors through the online system. Tutors used this information to help make decisions about transferring marks in "tutor led peer assessment sessions".

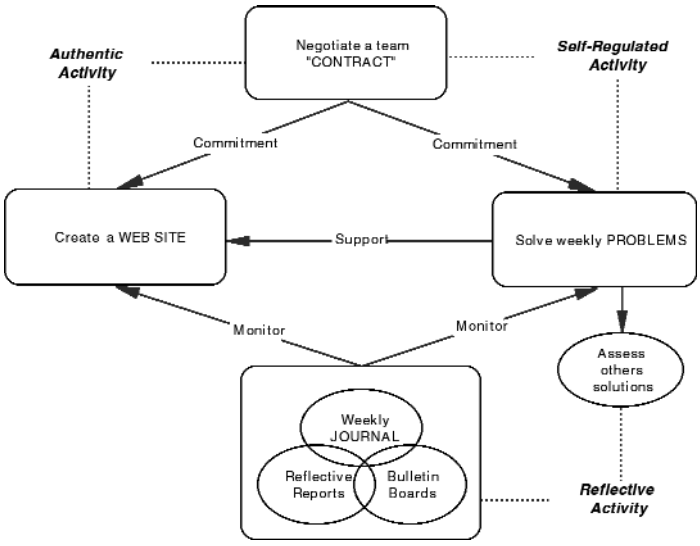
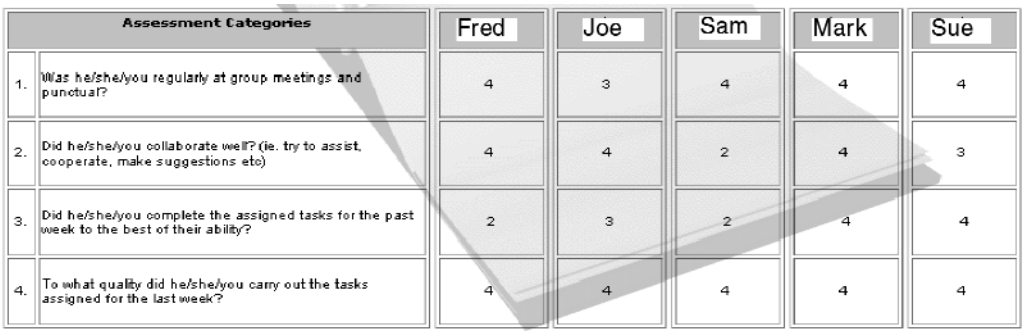


Figure 1: The learning environment

- Personal reflection on task and process - each student maintained a reflective journal in which personal views of progress of skills and competencies were recorded. Students considered the skills they applied, the skills that needed to develop and tasks that needed to be completed, as agreed to within the team. This provided a strong framework for the development of personal and process knowledge.

- In order to build the web site (and create solutions for the weekly problems), a high level of collaboration was required. The teams were required to share the workload, undertake separate tasks and maintain tight deadlines and schedules from one week to the next. Such activities demanded the students consider requirements of others, be adaptive, responsible and flexible.



	Assessment Categories	Fred	Joe	Sam	Mark	Sue
1.	Was he/she/you regularly at group meetings and punctual?	4	3	4	4	4
2.	Did he/she/you collaborate well? (ie. try to assist, cooperate, make suggestions etc)	4	4	2	4	3
3.	Did he/she/you complete the assigned tasks for the past week to the best of their ability?	2	3	2	4	4
4.	To what quality did he/she/you carry out the tasks assigned for the last week?	4	4	4	4	4

Figure 2: Sample journal entry showing self and peer assessment

Students were given both print and online resources to help develop solutions for the weekly problems. Participants could view the solution, peer/tutor feedback and overall marks online.

Summary: Implementing Interactive/Product-oriented Assessment

In this article we have depicted the core elements of an approach to assessment that provides opportunities for student engagement, participation and contribution to course content. The features of this form of assessment include performance assessment that requires students to create a product, engage in teamwork and elements of self and peer assessment. In designing the assessment consideration was give to the notions of pedagogical re-engineering and the creation of a workable, pragmatic approach within which to implement a participatory approach to learning and assessment. Laurillard (1996) combines the notion of media affordances and pedagogic re-engineering and has applied this to Open University courses. The notion of affordances examines each of the media and how they can provide a different form of interaction. Four modes are identified: attending, practicing, discussing and articulating. In designing the assessment task our goal was to decrease attending and increase each of the other forms of interaction. This meant applying the notion of student as participant, and as active contributor to the learning and assessment processes of the unit. Table 3 shows how student activity and assessment processes were integrated into participatory forms of assessment.

Modes of student interaction	**Student contributions to the unit**	**Interactive assessment activities**
¥**Attending**	Design and develop team web site	Intra-team peer review
• **Practicing**	Post solutions to weekly problems	Intra-team peer review
• **Discussing**	Post weekly journals	Inter-team peer review and commitment to tasks
¥**Articulating**	Develop electronic portfolio	Critique and peer feedback on portfolios
	Develop a team contract outlining team responsibilities	Negotiate roles and commitments for each team member

Table 3: Interactive-participatory assessment

At the end of the semester, the unit was evaluated with a CEQ questionnaire, as well as a focus group interview session. The results were very positive. Student comments strongly favoured the authentic nature of the unit, and were highly motivated by the "relevance" they could see in developing these skills for industry. Comments included:

- *"I wanted to have a product that would show industry/employers that I had skills."*
- *"I found it necessary to track my time carefully and set priorities, otherwise I would let the rest of the team down."*
- *"I enjoyed filling out the weekly journals. Not only did it let me consider how the team was going, but it was great to lay out all the tasks that needed doing."*
- *"This was the first unit that really got us doing teamwork. Other units just do a bit here and there, but this was full on teamwork, and it was working toward getting skills and a product that would promote us to the industry."*
- *"It was great to be able to see all the others teams work, and think about how it compared to ours."*

The response from the industry clients was also very positive, indicating the relevance of the skills demonstrated to industry needs.

Future Directions for Quality in Online Assessment

Judging by present trend, there is no doubt that Web-based learning and training will continue to expand, with the growth in markets, the trend towards lifelong learning and the need for universities to offer flexible, on demand educational services. In this scenario, it is likely that quality assurance processes for online assessment will intensify, with benchmarking procedures developed to compare learner performance to exit level or industry standards. Key questions that tertiary providers may have to respond to are: *How is this graduate performing in comparison with a professional in the field? What are the minimum exit standards for this student entering the profession?*

Another issue is that benchmarks must be transparent to the learners, and must represent authentic behaviour and expectations, rather than abstract decontextualised knowledge. These immediate trends are emerging in higher education and will impact on assessment design. Other innovations mentioned in this paper relate to a re-conceptualisation of curriculum as participatory, with students contributing resources rather than content being prescribed. This emphasis on knowledge building and participation has already brought about an increased focus on authentic assessment, which better reflects real world performance. On the horizon looms the question: If authentic, quality assessment and its demonstration depend upon performing in a genuine, real life situation what are the actual limits of online assessment? Will technology be able to meet the future challenge of the quality assurance agenda?

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