Assessment using new technology

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When we think about assessment using digital technologies, we often assume this means the introduction of computer-based tests. There are, however, other ways of using assessment for learning in which technology can play a useful and important role. This paper will discuss an innovative project, eVIVA, which uses mobile phones and the Internet to support formative assessment. The eVIVA project is currently being piloted by Ultralab, a learning and technology research unit at Anglia Polytechnic University, in schools across the UK. The initial pilot came to an end on 31 July 2003 but the project was then extended until July 2004. The chapter, reporting on the findings of the initial pilot, will discuss the development of the process, the responses of students and teachers to this new approach, and the implications of the project for developing a more student-centred approach to assessment and learning, and how this might impact on higher education.

Introduction

In a recent interview about this project the interviewer asked why it was necessary to use all this digital technology to assess students' work, why couldn't the teacher just sit down, talk to the students and mark their work just like in the 'good old days'? It was a good point!

Anyone who has taught in the classroom, particularly in the computer room, knows that the opportunity for dialogue about their learning, with one student in a class of 30 or more, is not easy. It is impossible to be in on every group discussion, and difficult to judge the thinking processes and effort behind pieces of work submitted for assessment, purely on the end result. How many teachers will recognise the scenario of returning work to students covered with comments and advice about how to improve the work, only to see the students focus more on the marks than on the feedback.

Any assessment tool or process which aims to enable the students to reflect on their work over time, allows them to share their thinking and early drafts of their work, gives them meaningful feedback from their teacher and their peers, empowers them and provides the teacher with a variety of evidence to support their judgements surely has to be worth a consideration!

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A question the interviewer didn't ask but well might have done is what all this has to do with higher education? After all universities have been assessing students successfully for years haven't they? Well not according to Richard Winter who states:

> In spite of the central importance of assessment in the work of universities, and the hundreds of years over which universities have been carrying out assessments, the current literature displays remarkable disquiet. (Winter, 2003, p. 112)

Maier and Warren claim that assessment techniques have tended to lag behind the innovative teaching that has been taking place in higher education, and blame much of this on the regulation concerning validation of courses that governs the type of assessment allowed. They go on to observe:

> However, we are seeing increasing interest in how we can assess students to support the varied learning outcomes we are adopting in our teaching programmes. (Maier & Warren, 2000, p. 131)

Collis and van der Wende observe that higher education institutions are still, by and large, focusing on their traditional target group of school leavers. They identify the main challenge for these institutions as determining how ICT can be used for the different target groups that higher education is expected to serve in the knowledge economy in the twenty-first century. These target groups include both traditional learners and lifelong learners from within and outside the country (Collis & van der Wende, 2002, p. 8).

According to the recent Department for Education and Skills consultation document on e-learning, one answer may be online assessment:

> In adult learning and workforce development, online assessment has the potential to widen participation by overcoming barriers such as time, location and cost. (Department for Education and Skills, 2003, p. 32, para. 90)

Russell (2003) describes Ultraversity, a virtual university developed by Ultralab, which is currently offering a radical new degree. It is radical in that it is completely work based, done completely by research and completely online. An issue for those involved in the development of this new-style degree has been the effective submission and assessment of students' work.

Although the eVIVA project was designed for younger students it has been recognised that this process, and the findings, have much to offer in informing assessment developments in this new undertaking.

Background to the eVIVA project

Ultralab was contracted to carry out a feasibility study for the Qualifications and Curriculum Authority (QCA) into the development of an online assessment tool for Key Stage 3 (KS3) Information and Communication Technology (ICT). The eVIVA pilot study initially ran from June 2002 until July 2003 and was part of a series of assessment projects created by the QCA to look at the online assessment of ICT at KS3.

Over the year eVIVA was piloted with 10 schools across the country. Students and their teachers were co-researchers in the project. The schools were asked to involve approximately 20 students in the pilot, and one teacher within the school, in most cases the ICT Co-ordinator, worked with an Ultralab facilitator to report their findings.

Students were asked to compile an online portfolio to provide annotated evidence of their ICT learning milestones. Once each 'digital portfolio' was ready, students were expected to participate in a telephone viva in which they answered a number of pre-selected questions about both their working processes and their learning journey. The assessment was not a high stakes test or examination, its purpose, and that of the portfolio, was to inform teacher judgement.

The aim of the study was to use eVIVA to encourage reflection and dialogue, both teacher-to-student and student-to-student, about the learning that had taken place and to enable the assessment of higher levels of attainment and understanding, rather than simply testing a body of knowledge.

Assessment for learning

From the start of the project our emphasis was on using the technology to support the assessment, not to generate it automatically. The role of the human assessor was seen as vital and the technology was seen as offering new ways to make that contribution light, viable and appropriate. There was also a requirement that the main focus of the assessment should be on formative assessment or assessment for learning.

For the purpose of the project we adopted the following definition of assessment as:

> All those activities undertaken by teachers, and by their students in assessing themselves, which provide information to be used as feedback to modify the teaching and learning activities in which they are engaged. (Black & Wiliam, 1998, p. 2)

Jonassen advocates investing the power of the technologies in the learners. 'Power to the people, so to speak' (1994, p. 4). Certainly the design of eVIVA is informed by constructivist theory (Bruner, 1986; Brown *et al.*, 1989) and aims to empower the participants to actively construct rather than passively receive their knowledge.

A starting point for the development of the eVIVA process was a consideration of the issue of fairness in assessment. Smith argues that although assessing all learners in a similar way, as in a test marked according to a fixed answer sheet, might be demonstrating 'external fairness':

> The child behind the test paper is of no importance; the contents of the test paper is the only concern. (Smith, 2001, p. 58)

She argues the case for an assessment system of 'internal fairness':

> With children who are developing … who are going through a process of learning about themselves, their talents and abilities do we not need to take their differences into consideration? (Smith, 2001, p. 58)

Mabry's (Smith, 2001) model of assessment paradigms (Table 1) identifies three paradigms of assessment:

- *The Psychometric Paradigm*, which serves the purpose of external fairness.
- *The Contextual Paradigm*, which serves the purpose of internal fairness and looks at the individuality of the group and in the context of teaching.
- *The Ipsative or Personal Paradigm*, which also serves the purpose of internal fairness and looks at the individuality of each learner and how the individual progresses in comparison to her- or himself.

Table 1.   Mabry's model of assessment paradigms (Smith, 2001, p. 58)

Psychometric	Contextual	Personal or ipsative
Standardised in content and administration	Curriculum-sensitive and group-sensitive	Student-sensitive: content setting and time vary
Objective items and formats	Objective and subjective items and formats	Subjective items and formats. Student involved in selection
External marking (machine)	Teacher marking	Teacher marking
No self-assessment	Self-assessment important	Self-assessment essential
Summative, no feedback beyond score	Formative use of results. Can be used summatively	Formative use of results. Can be used summatively

In developing the eVIVA software and assessment process our aim was to design an assessment tool that served the purpose of internal fairness, placing the pupil at the centre of the system rather than the teacher and the emphasis on formative rather than summative assessment. Therefore, it was the Ipsative Paradigm that influenced the design and indeed this is reflected in the name eVIVA, which stands for electronic virtual ipsative valid assessment.

Also integral to the process was the idea of a digital portfolio. As observed by Ridgeway and McCuskey there are three distinct uses for portfolios:

> The first is to provide a repository for student work; the second is to provide a stimulus for reflective activity—which might involve reflection by the student, and critical and creative input from peers and tutors; the third is as showcase, which might be selected by the student to represent their 'best work'. (Ridgeway & McCuskey, 2004, p. 14, sec. 3.3.3)

In designing the eVIVA online portfolio the intention was to provide a digital portfolio that fulfilled all three purposes. Again the pupil was placed at the heart of this process since the choice of content, the milestones, would lie with the pupil not the teacher.

The eVIVA process

The following features were identified as essential components to the eVIVA system:

- Dialogue between teachers and students about the learning process.
- Reflective review of their work by students.
- Self-assessment by students.
- Peer-assessment of work.

Our initial design called for each student to have online space for these objects:

- A personal profile area, including an introductory sound file.
- A profile from 'I Can' statements.
- Questions selected to be answered in a telephone viva.
- Date and time of viva, and phone number to be called.
- A portfolio of up to five or six milestones (uploaded project work).
- Annotations on all of the above, by themselves, or by others.
- The recording of their final telephone viva.

The development of both the web site and the SMS text messaging element was fairly straightforward. However, the challenges came with the introduction of the VXML technology involving the use of a voice gateway to mediate between the web site and the telephone calls.

Throughout the pilot, findings from teacher and student co-researchers informed each stage of software development. The current eVIVA process is outlined in Table 2.

The research questions

QCA set three main research questions for the pilot:

- What have we learned during the project regarding the assessment of ICT?
- What evidence, if any, is there that eVIVA improves teacher assessment of ICT activity by pupils?
- What are the ways in (and extent to) which eVIVA enables pupils to demonstrate their ICT capability?

Ultralab added a fourth question:

- Is this a fairer way to assess ICT?

Table 2.   The eVIVA process

- Students are registered as users of the eVIVA online space and assigned a user name and password. The eVIVA web site sends them a welcome message, instructions on how to proceed and an email.
- On first login students are prompted to complete a student profile, setting up their messaging preferences. They are then asked to carry out a simple bench-marking exercise by ticking a series of 'I Can' statements, which help to determine their entry level. This process generates a recommended level for their question choice.
- Students, with guidance from their teacher, select four or five questions, from the website, for their final telephone viva. This choice can be amended at any time during the project until the final viva.
- Students receive notification by their preferred method (email or SMS) when it is time to record a 'voice postcard' introducing themselves to their cohort. They dial the eVIVA freephone number to record their voice postcard. The resulting voice file is posted to their profile area on the eVIVA website. (N.B. This file serves a dual purpose as it can later be used to authenticate the final viva voice file)
- Throughout the duration of the project students use the portfolio feature of the web site to record significant 'milestone' moments of learning, and to upload supporting files of work. Each milestone is annotated or described by the student. Students have complete publishing rights over their work and can determine their audience (teachers, other students etc.) Students can link their milestones to their chosen questions and can draft written answers to these questions on the web site in preparation for the viva.
- Teachers use the annotation tool and the messaging feature to engage in dialogue with students about their learning.
- Students use the annotation tool and the messaging feature for peer-review and self-assessment and are encouraged to add comments to each other's work as well as their own.
- At the end of the project students are notified by SMS or email when it is time for their telephone viva. Students dial the eVIVA phone number, either by mobile or land phone, the questions are generated by the VXML from the question bank on the web site. The student's answers are recorded and sent to the eVIVA web site as separate sound files which are then attached to each of their chosen questions.
- The teacher comes to a decision regarding final assessment based on classroom activity, work submitted in the portfolio, student annotations, any written answers supporting the questions and the recorded answers from the viva.

The research methods

The research approach used in this study is that of an interpretative, naturalistic, practitioner enquiry. The research findings were used to guide the iterative development of eVIVA as a tool for assessment for learning. To achieve triangulation, feedback was collected from teachers, pupils and facilitators. Teachers and pupils were co-researchers in the project, with Ultralab facilitators visiting the pilot schools at least once a term, to interview teachers and collect feedback. A face-to-face meeting was also held each term at which further feedback was collated.

Feedback on the project was collected from students in a variety of different ways. An email address was set up to allow students to email free text comments directly to the facilitation team, and all 25 students who responded received a personal email thanking them for their contribution.

A small group of students at one school were interviewed regarding the project and the questions from this interview formed the basis for a simple exit questionnaire, which was set up online to collect students' anonymous responses. Thirty pupils responded to this questionnaire out of a potential 250 pupils taking part in the project.

Facilitators compiled a report on each school following each visit, based on the teacher response to the interview and observations during the visit. This report was shared with the teachers before being submitted. The facilitation team also met once a term to collate feedback.

The research findings

Teacher feedback

When asked if being involved in the project had been useful the response was overwhelmingly positive. Responses to the project's usefulness primarily related to the impact on pupils and listed factors such as:

- Increased motivation of pupils.
- Increased self-esteem.
- Awareness of audience.
- Pupils taking responsibility for their own learning and becoming independent learners.
- Improved teacher–pupil relationships.
- Recognition of the value of oracy.

Significantly, one of the teachers observed that assessment is no longer 'a bolt-on but is now integrated into the teaching process'.

Student feedback

Feedback on eVIVA from pupils was very positive, with the majority of pupils saying they enjoyed using the system. Several pupils said that they thought it was a better way of taking 'a test', that it was good to know the questions in advance and that it had increased their self-confidence. It was clear that they found using the system stimulating and many mentioned the fun of recording the voice files and messaging.

There were a small number of pupils, however, who were not quite so positive in their comments, saying that the system was challenging and one or two pupils mentioned finding the voice recording difficult and 'scary'. While these pupils were in the minority, it is interesting to note that these comments serve to highlight the fact that this system is genuinely challenging for pupils and not an easy option. One pupil claimed it was 'a bit too adventurous for now' while another thought the questions 'a bit hard and should have been easier for kids of our age'.

It was clear that pupils were motivated and engaged by the text and voice messaging features of the system but their responses also showed that they valued the feedback provided by both their peers and their teachers.

What have we learned during the project regarding assessment of ICT?

> It's proved it is really difficult! (Teacher, School A)

This was probably the most telling comment regarding the assessment of ICT because it was a recurring theme throughout the project. The discussions surrounding the bench marking 'I Can' statements and the eVIVA questions brought the shortcomings of the existing system into sharp relief, and made clear how much confusion there is about National Curriculum levels and how to interpret them.

> They are better than they thought! It has been motivating for students—positive reinforcement. (Teacher, School B)

It has become clear from both teacher and student feedback that students are motivated and empowered by sharing their work in an online space. Exhibiting their work in an online portfolio appears to give students a sense of audience and serves to lift their expectations. As one School A student observed:

> The best bit about eviva is sharing thoughts! (Student, School A)

Feedback from the teachers has stressed the importance of involving students in assessing their own progress thus enabling them and empowering them to take responsibility for their own learning. It was clear from student feedback that many enjoyed their involvement in eVIVA, and recognised benefits such as noted here by another School A student:

> Milestones … help us realise how much we know on computers. (Student, School A)

While this student from School H gave eVIVA a rating of 9/10,

> I think eviva is a good way to show off what your ICT skills are shown as. It's also good because you can see what other people have been doing. (Student, School H)

However, not all of the comments were positive and some concerns were expressed,

> I didn't like the milestones because it was too much extra work … The questions were also a bit hard and should have been easier for kids of our age. (Student, School A)

> I think it is a bit too adventurous for now. (Student, School A)

> My eviva experience was scary because I've never experienced anything like it, the good bits were the messages, voice postcard and posting things on the site. I didn't like the questions and the I CAN statements because I thought that was hard. The voice postcard was scary because I sound really weird on the phone and I kept on doing it over and over again because I thought I wasn't doing it right. (Student, School A)

It is important to remember that what we are asking students to do here is not an easy option and not everyone relishes the challenge. What was clear from teacher feedback is that the 'I Can' statements promoted dialogue with students and this gave teachers a clearer understanding of student's prior learning and their abilities. In their turn students gained a clearer understanding of what they were doing and how their work was being assessed. However, it is also evident from the milestones uploaded to the website that many students failed to do themselves justice in annotating their work and their comments show that they clearly found it 'scary', 'hard' and even 'adventurous' to be asked to identify their moments of learning.

Another benefit of eVIVA highlighted by teacher feedback was the potential for peer review:

> As a school the only way we had assessed ICT previously was by looking at portfolio of work produced on the school system. The eVIVA means that work can more easily be shared and student self-evaluation as well as evaluation by peers happens. (Teacher, School C)

However, as with milestone annotation, student skill in peer review is something that varies from school to school. It was certainly clear from teacher feedback that the issue of 'peer review' and the use of annotation by both teacher and student was an area needing further exploration and development.

What evidence, if any, is there that eVIVA improves teacher assessment of ICT activity by pupils?

> Gut feeling that it does. Makes the teacher think more about the assessment criteria (Teacher, School A)

This teacher's response to this question really typified the feedback on this issue. Overall, the feedback from the schools consisted of feelings, thoughts, impressions, and in some cases convictions that students have 'considered the details of assessment more closely' (Teacher, School B).

According to another teacher eVIVA has opened up a new process of assessment not previously used in her school:

> Staff think more about assessment process … focus more on assessment process because teachers have had to talk with children about the process. (Teacher, School F)

Similarly, teacher feedback indicates that eVIVA has encouraged a dialogue about the learning process between teacher and student, as well as student-to-student.

> Students now have far more understanding of the assessment process—This will undoubtedly lead to improvements in the quality of their work. (Teacher, School H)

When asked how they would use the feedback from eVIVA to inform their final assessments several teachers mentioned the value of having an online portfolio, which is easily accessible and supports continuous assessment. As one teacher commented:

> The portfolio is best feature for teacher assessment. (Teacher, School E)

Another teacher indicated that the feedback would be used to help with coaching and improving standards, while yet another observed that:

> I will be interested in anything that gives me an insight into how they think and any processes that are hidden to me. (Teacher, School D)

Interestingly, over half of the teachers said that eVIVA had changed, encouraged or facilitated the way in which they assess students and two more said that while it hadn't changed the way they had done things this year they would be incorporating elements of the process into what they do next year:

> I feel that continuous assessment and the pupils setting targets for themselves that eViva encourages (the 'questions' are the targets) is very beneficial. (Teacher, School I)

What are the ways in (and extent to) which eVIVA enables pupils to demonstrate their ICT capability?

As previously identified, doing the 'I Can' statements has helped clarify both teacher and student understanding of the levels. The combination of the viva and the annotation tool offers more opportunities for students to demonstrate their thinking and the processes behind their work.

Certainly responses to the exit questionnaire, from students who successfully completed their final vivas, show that they found it a rewarding experience:

> I … enjoyed doing my questions over the phone as well. It was easy and enjoyable. (Student, exit questionnaire)

> I enjoyed preparing for the test and picking out questions so that you sort of (k)new what level that you were on. (Student, exit questionnaire)

> I enjoyed the different way to do the exam which was to phone up a number and answer different questions and talk about myself. (Student, exit questionnaire)

Teacher feedback also indicates that eVIVA provides students with a forum or showcase, offering a wider view of their work and the opportunity to check against national standards; this has the added consequence of increasing their confidence. Similarly, teachers can benefit from the cross-fertilisation of ideas. The opportunity for students to share or showcase their work is seen as a motivator, and as offering encouragement, particularly if annotations and messages are attached to their work:

> It allows students to demonstrate their ICT capability to their peers not only to staff—even to outside of their own community. (Teacher, School F)

The issue of self-assessment was mentioned by several of the teachers:

> eVIVA has allowed pupils to be more involved in self-assessment and target setting. They have been more thoughtful about their work. For example, they knew they were going to be asked a question about 'how they took into account the audience' and therefore were thinking about this as they were working on their webpage on the topic of Healthy Living. (Teacher, School I)

Is this a fairer way to assess ICT?

> Is 'Fair' best term? Would say it is 'better' because of peer reflection, self evaluation as part of assessment process. (Teacher, School F)

It could be argued that eVIVA has the potential to be a fairer or 'better' system! However, it is clear that students need more training in some of the reflective processes that the system

supports. Also teachers need to build the process into their way of working to make good use of annotations.

It is apparent that during an ICT lesson there are lots of technical demands on the teacher, which make it difficult to have much one-to-one dialogue with the pupils about their work or their learning. The annotation feature of the system offers an additional opportunity for this dialogue and indeed provides the quiet or 'wait' time that Black and Wiliam (2002) consider so important in the classroom situation. Also the oral element potentially offers greater fairness, but needs to be extended to other parts of the process, such as annotation, to make it easier for those with writing difficulties to enter their comments through speech rather than text.

The system offers continuity and the ability to track progression across Key Stages, year groups and staff changes. It also offers staff the opportunity to moderate each other's work online and has the major advantage of transparency.

The software

Our brief was to design and provide software that would allow the following:

- Students to display their work for its formative assessment through assessor/teacher interaction.
- Students to demonstrate their knowledge and understanding and map it to National Curriculum levels.
- Assessors/teachers to give students feedback on how to improve their work.
- An online space for each student to contribute and build an online portfolio.
- A self-assessment tool to provide the student with a set of prompts in the online space.
- Opportunity for students to interact with a teacher assessor in the style of an e-viva.

The system produced had to work with all hardware and software school systems and had to cope with a variety of different file types in the digital portfolio space. The resulting software is effectively an online database, which can be accessed through any web browser and the Internet. The elements which make the software distinctive are the use of VXML and a voice gateway to generate the viva questions and transfer the viva recordings to the web site, and the use of an SMS gateway to send text messages to the web site. Although there were some initial teething problems with the software, the main technical problem experienced was in meeting the project deadlines. It took far longer than expected to develop the VXML and SMS elements of eVIVA and this meant it took longer for teachers and pupils to come to grips with the process.

However, as the quote below indicates, the software, once completed, fulfilled and exceeded all requirements and expectations:

> Overall, I am amazed at how efficiently the software works given its complexity and use of sound files … There have been some technical problems but as a pilot system I am impressed with the effectiveness of the system. My pupils were obviously frustrated at times by technical difficulties but were enthusiastic to persist. (Teacher, School I)

There are several aspects of the software that still need to be refined, amended or developed further but overall the system works.

Teacher workload

It was an important part of our initial brief that the eVIVA system should not increase teacher workload. Teacher feedback on this issue was mixed. Three of the teachers claimed the system was manageable, or had minimal impact on their workload, with one going so far as to say:

> Found it easy—prepared to be critical, but it was dead easy … Impact on teacher workload—a lot easier as no homework to take home—at least in the form of books to mark. Around 70% of children have computers at home and 50–60% have Internet access. System straightforward so not a long time to learn—children found it easy. (Teacher, School G)

One issue raised was that of the time involved in listening to the sound files. One teacher mentioned this as being problematic particularly if scaled up but no one else picked up on it and, in contrast, another teacher observed how much better it was assessing portfolios and online work than marking books.

The main issue raised was that of the time required to introduce the system, particularly explaining the 'I Can' statements, trying to encourage annotations and milestone uploads etc. and the way in which this ate into time needed to cover schemes of work and lesson content. However, balanced against this many of the teachers identified benefits such as getting to know the children and their capabilities much better. It was interesting that their focus was on identifying strategies for overcoming these problems arguing that, once students and staff were familiar with the system and the process, it would ultimately save time.

Conclusion

To summarise then, our key findings from the eVIVA pilot are as follows:

- Students are motivated and empowered by sharing their work in an online space. Exhibiting their work in an online portfolio appears to give students a sense of audience and to lift their expectations.
- eVIVA encourages a dialogue about the learning process between teacher and students as well as between student and student.
- Teachers value having an online portfolio which is easily accessible and supports continuous assessment.
- The combination of the viva and the annotation tool offers more opportunities for pupils to demonstrate the thinking and processes behind their work.
- eVIVA provides students with a forum or showcase for their work which helps their confidence.
- Through the annotation tool eVIVA offers students an additional opportunity for reflection and dialogue with their teachers, providing 'wait' time otherwise difficult to achieve in the ICT classroom.

Although this project looked specifically at students in secondary schools, in the curriculum area of ICT, I would argue that, for those carrying out assessment in any classroom at any age or level, many of the issues surrounding assessment are similar, if not the same.

As Winter (2003) observes, 'assessment' is the core business of universities. He draws on the work of Biggs (1999, cited on p. 113) and Prosser and Trigwell (1999, cited on p. 113) to

distinguish between 'deep' and 'surface' learning, with the 'deep' approach being where the student tries to use the most appropriate cognitive strategies for handling tasks, and the 'surface' approach being when the student tries to get the tasks out of the way with the minimum trouble, while appearing to meet the requirements. He claims that currently:

> The whole educational enterprise is frequently ineffective at the most basic level. All too frequently our teaching fails to elicit more than an attempt by our students to exploit the ambiguities in our assessment processes, to play the system. (Winter, 2003, p. 114)

If he is right then perhaps projects such as eVIVA can provide insights and findings that might be useful in informing new approaches to assessment in the higher education sector.

Notes on contributor

Lesley McGuire—a former teacher, Lesley has an M.Sc. in Computer Based Learning and her first involvement with Ultralab was in 1998 when she became an advisory teacher on their SchoolNet 2000 project. In January 2001, she officially joined Ultralab to work on the Talking Heads project, an online community for teachers. In 2002, Lesley became Project Director of eVIVA, an innovative pilot project exploring the use of digital technology in the formative assessment of students' ICT capabilities. In 2004, Lesley also took on responsibility for marketing and leading the third cohort of Ultraversity, Ultralab's radical new online degree project.

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