



Hochschule für Angewandte
Wissenschaften Hamburg
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Moodle Quiz Archiver

Future Proof Archiving of Exam Results

Moodle University Conference

Moodle an Hochschulen e.V.

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Today I will talk about, how

I accidentally created yet another, but hopefully the last,
quiz archiving plugin for Moodle ...

- ❗ Challenges and requirements when archiving digital exams
- 📦 Why not just use one of the existing solutions?
- ⚙️ The novel Quiz Archiver Moodle plugin (Overview & Live Demo)
- 🧪 Current development and next steps
- 💬 Open discussion about the plugin and digital archiving solutions



A glimpse of the challenges that arise, when archiving digital assessments:

- Archives must still be **readable** in 10 years
 - ... while ensuring, that archived data is static and will not display differently in the future
 - ... without requiring an ancient Moodle instance and long unmaintained plugins
- Data must be stored **tamper-proof** and **digitally signed**
- Support for a wide range of **question types**, including third party plugins
 - Not only HTML, but also file submissions, (external) images, ...
 - Dynamically rendered components: MathJax formulas, GeoGebra applets, ...
- Archive tasks must be **complete**, **traceable**, and **correct**, but also **GDPR compliant**
- The archiving process must be **simple** and should not require extensive digital skills
- Quiz reports must be **customizable**, according to the institutional requirements



A plethora of attempts to solve this problem exist. To name a few:

- Moodle's built-in attempt review page (manually printing to PDF)¹
- Quiz archive report (quiz_archive)²
- Quizattemptexport (local_quizattemptexport)³
- QuizExport (quiz_export)⁴
- exportresults (quiz_exportresults)⁵
- Assign Submission Download (local_assignsubmission_download)⁶

¹https://docs.moodle.org/403/en/Quiz_reports

²https://moodle.org/plugins/quiz_archive

³https://github.com/MoodleNRW/moodle-local_quizattemptexport

⁴https://moodle.org/plugins/quiz_export

⁵https://moodle.org/plugins/quiz_exportresults

⁶https://moodle.org/plugins/local_assignsubmission_download





⚠ Problems with existing solutions

- Dynamic content, such as MathJax formulas, is not supported, or attempts are not rendered as originally shown to the student
- Missing customization options, e.g., to export with(-out) example solutions
- PDFs must be exported manually or require additional technical knowledge
- Systems fail when quizzes have a large number of attempts
- Installation of additional software on the Moodle server and security problems
- Archiving process is unclear or prone to human error

Comparison of *Quiz Archiver* and *Quizattemptexport*:
<https://moodlenrw.de/course/view.php?id=125>





A modern Moodle plugin that archives quiz attempts as PDF files for long-term storage independent of Moodle.



Available on



 Moodle Plugin Directory: https://moodle.org/plugins/quiz_archiver

 GitHub Repository: https://github.com/ngandrass/moodle-quiz_archiver

 Free to use under the GNU General Public License v3.0

Created quiz archives can contain various data.
Contents are freely configurable.

- Attempt export (attempts/)
 - PDF export
 - HTML source
 - Attachments
- Moodle Backups (backups/)
 - Quiz activity
 - Full course
- Attempts Metadata (.csv)
- Checksums for all files (.sha256)

Berechnen Sie den Flächeninhalt, der von der Kurve $f(x) = 3 \cdot x^2 - 3$ und der x -Achse komplett eingeschlossen wird.

a) Geben Sie zunächst die Grenzen des Integrals an, mit dem der Flächeninhalt berechnet wird.

Ihre letzte Antwort wurde folgendermaßen interpretiert: 5

$A = \int | \dots | dx$

Ihre letzte Antwort wurde folgendermaßen interpretiert: 0

b) Bestimmen Sie die Stammfunktion der Funktion $f(x)$:

$F(x) = \text{[3x^3/3-3]3x} + C, C \in \mathbb{R}$

Ihre letzte Antwort wurde folgendermaßen interpretiert: $3 \cdot x \cdot \left(\frac{x^3}{3}\right) - 3 \cdot x$

c) Geben Sie nun den gesuchten Flächeninhalt an:

$A = \text{[4]}$

Ihre letzte Antwort wurde folgendermaßen interpretiert: 4

✗ zu a): Die Integrationsgrenzen sind falsch.
Hinweis: Die Integrationsgrenzen sind die Nullstellen der Funktion.

✗ zu b): Die Stammfunktion ist falsch.

✗ zu c): Die Fläche ist auch unter Berücksichtigung von Folgefehlern aus a) und b) falsch.

Musterlösung:
Bestimmen Sie zunächst die Nullstellen der Funktion f , dies ergeben die Integrationsgrenzen:
 $3 \cdot x^2 - 3 = 0 \Leftrightarrow x^2 = 1 \Leftrightarrow x_{1,2} = \pm 1$

Eine Stammfunktion von $f(x) = 3 \cdot x^2 - 3$ ist das unbestimmte Integral
 $F(x) = \int (3 \cdot x^2 - 3) dx = x^3 - 3 \cdot x + C, C \in \mathbb{R}$

Der Flächeninhalt ist das Integral von $[3 \cdot x^2 - 3]$ über x . Da die Funktion f zwischen den Nullstellen negativ ist (siehe den untenstehenden Graphen der Funktion f), kann der Faktor -1 für den Absolutbetrag verwendet werden:

$$A = \int_{-1}^1 |3 \cdot x^2 - 3| dx = - \int_{-1}^1 (3 \cdot x^2 - 3) dx = -[x^3 - 3 \cdot x]_{-1}^1 = 4$$

Eine richtige Antwort ist 1. Sie kann so eingegeben werden: 1
Eine richtige Antwort ist -1. Sie kann so eingegeben werden: -1
Eine richtige Antwort ist $x^3 - 3 \cdot x$. Sie kann so eingegeben werden: $x^3-3 \cdot x$
Eine richtige Antwort ist 4. Sie kann so eingegeben werden: 4

MM	Max Mustermann
Kurs	Example Moodle Course for Quiz Archiver (Course-ID: 31)
Test	Example Quiz (Quiz-ID: 36)
Begonnen am	Friday, 21. April 2023, 09:06
Status	Beendet
Beendet am	Friday, 21. April 2023, 10:06
Verbrauchte Zeit	1 Stunde
Bewertung	15,50 von 40,00 (39%)
Feedback	Sie haben den Test leider nicht bestanden.
Archiviert	Monday, 13. November 2023, 16:01

Information

Frage markieren

Hinweise zur Bearbeitung der Aufgaben

Zwischenspeicherung der Eingaben

Beachten Sie: Die Zwischenspeicherung Ihrer Antworten erfolgt stets durch einen Seitenwechsel.

Eingabe der Antworten

- Wie Sie Brüche, mathematische Zeichen und Funktionen eingeben, finden Sie in der Tabelle „Hinweise zur Formeleingabe“ auf der rechten Seite unterhalb der Test-Navigation.
- Die Eingabe einiger spezieller Zeichen wird in den zugehörigen Aufgaben direkt angegeben.
- In den Antworten sind in der Regel **keine Kommazahlen** erlaubt. Wenn in der Aufgabe nicht anders beschrieben, geben Sie Ihr Ergebnis stattdessen als **Bruch**, ggfs. als **Quadratwurzel** ein.
- Wenn Sie eine Antwort eingeben, wird diese interpretiert und unter oder neben dem Eingabefeld angezeigt. **Überprüfen Sie bitte genau, ob Ihr Ergebnis wie gewünscht und fehlerfrei interpretiert wurde** und korrigieren Sie es gegebenenfalls.
- Das Ausmultiplizieren und Vereinfachen von Ergebnissen ist nur notwendig, wenn explizit darauf hingewiesen wird.

Generell: **Fragen Sie, wenn Ihnen unklar ist, wie Sie Ihre Antwort eingeben sollen!**

Antworten-Rückblick

Schritt	Zeit	Aktion	Status
1	21. April 2023, 09:06:45	Begonnen	
2	21. April 2023, 09:06:50	Gesehen	
3	21. April 2023, 10:06:45	Versuch beendet	
4	25. April 2023, 19:16:58	Versuch beendet	

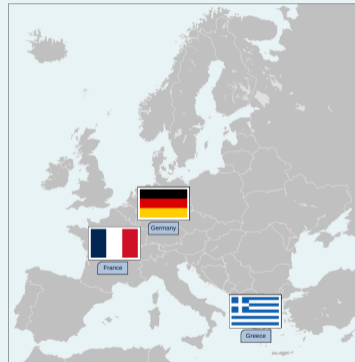
Question 13

Correct

Mark 1.00 out of 1.00

Flag question

Please drop the flags and country names into the map.



Your answer is correct.

Created Quiz Archives (User Interface)



Create new quiz archive

Trigger the creation of a new quiz archive by submitting this form. This will spawn an asynchronous job which will take some time to complete. You can always check the current status on this page.

Settings

- Quiz Reference Quiz (standard question types)
- Attempts
- Export quiz attempts (3)
 - Include quiz header
 - Include overall quiz feedback
 - Include questions
 - Include individual question feedback
 - Include general question feedback
 - Include correct answers
 - Include answer history
 - Include file attachments
- Backups
- Export Moodle quiz backup (.mbz)
 - Export full Moodle course backup (.mbz)

Advanced settings

- Paper size
- HTML files Keep HTML source files
- Archive name
- Report name
- Automatic deletion Enable
- Retention time days

Archive quiz

Archives

Start time	Status	User	Job ID	Size	
2024-02-20 10:55:15	Finished	admin	259aac2-cfd6-11ee-a8d7-0242c0a98005	5.7 MB	

Quiz archive details

Job ID	3a96745c-3a98-11ee-8d8e-0242ac150005																						
Status	Finished																						
Course	Example Moodle Course for Quiz Archiver																						
Quiz	Example Quiz																						
User	Admin User (admin)																						
Time created	14 August 2023, 1:46:38 PM																						
Time modified	14 August 2023, 1:48:05 PM																						
Filename	quiz_archive_cid31_cmuid108_qid36_2023-08-14_134804.tar.gz																						
Size	33.9 MB																						
Quiz archive	Checksum: sha256:a43f2554504c28a232e0884f2881f00b6214763f88e2d745bf93c4430b6d715																						
	Download file																						
Signature	Signed on 7 November 2023, 12:38:49 PM by https://freetlsa.org/tsr Download: query.tsq - reply.tsr																						
Settings	<table><tbody><tr><td>Number of attempts</td><td>25</td></tr><tr><td>Export quiz attempts</td><td>1</td></tr><tr><td>Include quiz header</td><td>1</td></tr><tr><td>Include overall quiz feedback</td><td>1</td></tr><tr><td>Include questions</td><td>1</td></tr><tr><td>Include individual question feedback</td><td>1</td></tr><tr><td>Include general question feedback</td><td>0</td></tr><tr><td>Include correct answers</td><td>0</td></tr><tr><td>Include answer history</td><td>1</td></tr><tr><td>Export Moodle quiz backup (.mbz)</td><td>1</td></tr><tr><td>Export full Moodle course backup (.mbz)</td><td>0</td></tr></tbody></table>	Number of attempts	25	Export quiz attempts	1	Include quiz header	1	Include overall quiz feedback	1	Include questions	1	Include individual question feedback	1	Include general question feedback	0	Include correct answers	0	Include answer history	1	Export Moodle quiz backup (.mbz)	1	Export full Moodle course backup (.mbz)	0
Number of attempts	25																						
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Include general question feedback	0																						
Include correct answers	0																						
Include answer history	1																						
Export Moodle quiz backup (.mbz)	1																						
Export full Moodle course backup (.mbz)	0																						



- Archiving of quiz attempts as PDF/HTML files, incl. file submissions
- Made for long-term storage, fully independent of Moodle
- Customization of generated PDF and HTML reports
- Supports MathJax, STACK plots, and other dynamic JS content
- Inclusion of Moodle course and quiz backups (.mbz)
- Integrity checks via checksums for every quiz report
- Cryptographic signing / attestation of archives and their creation date using the Time-Stamp Protocol (TSP)
- GDPR compliant and offers configurable data retention policies
- Fully asynchronous archive creation to reduce load on Moodle Server
- Data-minimising and security driven design

➡ Full list: https://github.com/ngandrass/moodle-quiz_archiver

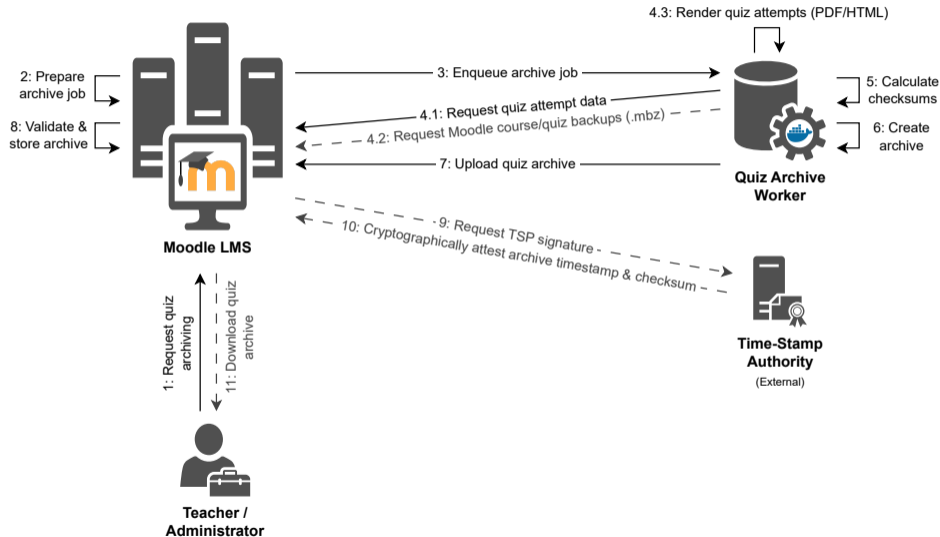


Figure 1: Plugin architecture and information flow




Live Demonstration





 Quiz archives can be customized in a variety of ways.

- Include feedback
- Include correct answers
- Include Moodle backups and file attachments
- Paper size
- Dynamic, variable based, filenames
- ...

 Each setting has a preset value that can be configured globally within the plugin settings menu.

 Individual settings can be locked to their global preset.

Settings

- Quiz Reference Quiz (standard question types)
- Attempts
- Export quiz attempts (3)
 - Include quiz header
 - Include overall quiz feedback
 - Include questions
 - Include individual question feedback
 - Include general question feedback
 - Include correct answers
 - Include answer history
 - Include file attachments
- Backups
- Export Moodle quiz backup (.mbz)
 - Export full Moodle course backup (.mbz)

Advanced settings

- Paper size A4
- HTML files Keep HTML source files
- Archive name quiz-archive- $\{courseshortna\}$
- Report name attempt- $\{attemptid\}$ - $\{userr\}$
- Automatic deletion Enable
- Retention time 1095 days



<p>Include correct answers <small>quiz_archiver job_preset_export_report_section_rightanswer</small></p>	<p><input type="checkbox"/> Default: Yes</p> <p>Display the correct answers for each question inside the report.</p> <p>This setting may be hidden, based on the value of <code>quiz_archiver/job_preset_export_report_section_question</code>.</p>	<p><input checked="" type="checkbox"/> Locked</p>
<p>Include answer history <small>quiz_archiver job_preset_export_report_section_history</small></p>	<p><input checked="" type="checkbox"/> Default: Yes</p> <p>Display the answer history for each question inside the report.</p> <p>This setting may be hidden, based on the value of <code>quiz_archiver/job_preset_export_report_section_question</code>.</p>	<p><input type="checkbox"/> Locked</p>
<p>Report name <small>quiz_archiver job_preset_export_attempts_filename_pattern</small></p>	<p><input type="text" value="attempt-\${attemptid}-\${username}_\${date}"/> Default: <code>attempt-\${attemptid}-\${username}_\${date}-\${time}</code></p> <p>Name of the generated quiz attempt reports (PDF files). Variables must follow the <code>\$(variablename)</code> pattern. The file extension will be added automatically.</p> <p>Available variables:</p> <ul style="list-style-type: none">• <code>\$(courseid)</code>: Course ID• <code>\$(coursename)</code>: Course name• <code>\$(courseshortname)</code>: Course short name• <code>\$(cmid)</code>: Course module ID• <code>\$(quizid)</code>: Quiz ID• <code>\$(quizname)</code>: Quiz name• <code>\$(attemptid)</code>: Attempt ID• <code>\$(username)</code>: Student username• <code>\$(firstname)</code>: Student first name• <code>\$(lastname)</code>: Student last name• <code>\$(timestart)</code>: Attempt start unix timestamp• <code>\$(timefinish)</code>: Attempt finish unix timestamp• <code>\$(date)</code>: Current date (YYYY-MM-DD)• <code>\$(time)</code>: Current time (HH-MM-SS)• <code>\$(timestamp)</code>: Current unix timestamp	<p><input checked="" type="checkbox"/> Locked</p>

Forbidden characters: `\. : ; * ? ! " < > |`



- Backwards compatibility for Moodle 4.1 (LTS) and PHP 7.4⁷ maintained until EOL of Moodle 4.1 on 2025-12-08
- PHPUnit tests for most key functions
- Automated CI execution of tests on all supported Moodle and PHP versions with both PostgreSQL (*recommended*) and MariaDB/MySQL
 - Moodle 4.1 (LTS), 4.2, 4.3
 - PHP 7.4, 8.0, 8.1, 8.2

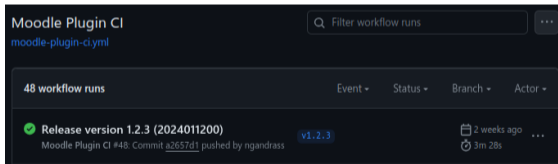


Figure 2: GitHub Workflow for Plugin CI Jobs⁸

⁷If you are still using PHP 7.4, **upgrade now!** PHP 7.4 stopped receiving security updates in 2022. **Upgrade to PHP 8.1 ASAP!** No excuses ;)

⁸Workflow definition on GitHub: [/.github/workflows/moodle-plugin-ci.yml](#)




- All Moodle core question types are confirmed to work, however ...
- Large drag and drop images will not be rendered correctly
 - Problem with the Moodle core question types
 - Official bug report filed in Moodle Tracker: #MDL-80473

We want need You!

A handful of people will not catch every bug or encounter edge-case problems.



Please report bugs you found within the  GitHub issue tracker:
https://github.com/ngandrass/moodle-quiz_archiver/issues

I have some ideas ...

- Expansion of scope to include file upload activities (mod_assign)
- Support of external storage providers (e.g., S3 WORM storage) to extend/replace Moodle data storage
- Integration with yet to come E-Assessment related plugins
 - Moving away from a single big monolithic plugin to multiple smaller plugins that are tailored to their specific tasks
- Ensuring maintenance of this plugin

 **We ... again ... want need You!**

However, these are just my ideas...

But what do **you** want or need?

A number of feature requests from different universities already exist:

- Integration of additional user attributes in report header (e.g., matriculation number)
- Support Moodle developers fixing problems with drag-and-drop question types
- Export of single-user quiz archives
- Automatic archiving of quiz attempts
- Enabling quiz archiving on a per (sub) course category basis
- Inclusion of additional activities (e.g., assignments)
- Simplification of setup process
- Automatic transfer of archives into external storage solutions
- Display fixes for specific third-party question types





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Moodle an
Hochschulen
AG Entwicklung & SIG E-Assessment

Any Questions ?



Be part of the discussion and future developments!

-  File an issue or feature request on GitHub:
https://github.com/ngandrass/moodle-quiz_archiver
-  Join AG Entwicklung: <https://moodle.hu-berlin.de/course/view.php?id=37191>
-  Join SIG E-Assessment: <https://moodle.hu-berlin.de/course/view.php?id=71759>
-  Contact me via E-Mail: <Niels.Gandrass@haw-hamburg.de>
-  Raise your hand right now ;)