

Gamified Quizzes for Higher Education Classroom Teaching : a Survey

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Nowadays there are many quiz-software claiming that they can help teachers to improve their teaching. Such software allows a teacher to create an electronic quiz, either to be run live (**online**) in the classroom, or **offline** as homework. A clear advantage of an electronic quiz is that the teacher can obtain various statistics from the collected students' answer, and hence becoming more aware of her students' learning state. An online quiz has an additional advantage that it fosters live interactions between the teacher and the students.

Some quiz-software also gamifies the quizzes. This usually comes in these forms. (1) **Appearance**: additional graphics and sounds are added to the questions to make them appear game-like, with the idea of inducing a playful state of mind on the participants. E.g. this might be used to relax the emotional distance between the students and teacher. (2) **Reward**: points or other virtual prizes can be earned by giving right answers. (3) **Competition**: by showing off a high score board. Whether gamification will actually improve teaching will depend on how a teacher uses it. But in any case, gamification adds interesting new dimensions to the quizzes, which teachers might want to explore to maximize the impact of their quizzes.

We reviewed 11 quizz software --we want to know which ones would be good choices to help university teachers to improve the quality of their classes. The emphasis of this survey is at class-level improvement. With respect to this goal, being able to do online quizzes would be a must-have feature, whereas offline quizzes would be nice to have, but not essential for our consideration. For the same reason, a feature to evaluate an individual student's performance will also be left out from this survey,

All of the 11 software we reviewed facilitate online (classroom) quizzes. Another must-have feature is feedback for teachers on how the class performs per given quest. Two of the software turn out not to have the features. The remaining **nine** are listed below. A feature to evaluate the performance of

Name	Website	Pricing model	Open source
<i>Kahoot!</i>	https://kahoot.it/	Free for non-commercial use.	N
<i>Poll Everywhere</i>	https://www.polleverywhere.com	Free up to 25 responses per quiz. Else monthly subscription is needed; the price depends on the number of responses we want to accommodate. E.g. for 200 responses per quiz, it is 199\$/month.	N

<i>Socrative</i>	https://socrative.com	60\$ yearly subscription to accommodate 150 students.	N
<i>GoSoapBox</i>	http://www.gosoapbox.com	Free for up to 30 students.	N
<i>TopHat</i>	https://tophat.com	26\$ per student per term.	N
<i>Quizlet</i>	https://quizlet.com	Free but not ad-free. A student can buy an ad-free client for 20\$ and also get some additional functionalities e.g. to store audio recording or creating her own learning diagrams.	N
<i>Savsoftquiz</i>	https://savsoftquiz.com	458\$	Y, after purchasing the software
<i>Arsnova</i>	https://arsnova.click/	Free	Y
<i>Quizziz</i>	https://quizziz.com/	Free	N

Table: nine quizz software we compared.

To support University classrooms, some additional features would be very desirable (should-have features):

- **Analytics:** providing more strategic class-wide feedback for teachers, e.g. how a class cumulatively performs over multiple quizzes, and how the same quiz is made by different classes.
- **API access:** to allow universities or other parties to build more powerful teaching tools/software by composing the quiz-software with other (their own) components.

Integration with **social networks** is a nice could-have feature. The simplest form of this is a feature to share at least some element of the quiz (e.g. the scoreboard) to a social network.

Below we compare the above quiz software based on their gamification (does it have a game-like appearance, does it gives reward, is it competitive?), and existence the above three mentioned features.

Name	A	R	C	An	API	Soc
<i>Kahoot!</i>	Y	Y	Y	N	N	Y
<i>Poll Everywhere</i>	N	Y	N	N	Y	N
<i>Socrative</i>	N	Y	Y	N	N	N
<i>GoSoapBox</i>				N	N	N
<i>TopHat</i>	N	Y	N	*	N	N

<i>Quizlet</i>	N	Y	Y	N	N	Y
<i>Savsoftquiz</i>	N	Y	N	N	N	Y
<i>Arsnova</i>	Y	Y	Y	N	N	N
<i>Quizizz</i>	Y	Y	Y	N	N	Y

A : have a game-like appearance

R : have a reward system

C : have a competition mode

An : provide class-wide analytics (as defined before)

Soc : provide a share function to a social network

* : too little information to determine; but probably a "N".

Table: Quizz software compared on their should-have and could-have features.

All nine quiz software listed above have the must-have features. However, it turns out that none of them have the full set of should-have and could-have features. None of the reviewed software provide class-wide strategic analytics. Except for Poll Everywhere, none of them offer API access, and therefore we cannot use them in a composition with other services. Too bad.

The popular Kahoot! and Quizizz offer the most features, including all three aspects of gamification, and are free. Quizlet might be an alternative. It is not free, but it is not expensive either. However, Quizlet focuses more on improving students' individual learning, so if the primary goal is to improve classroom learning, Quizlet might be an overkill.

Arsnova offers an interesting alternative. Of all the options surveyed, Arsnova is the only one that is open source and free, recently created (2017) by a group of students of TH Mittelhessen. It has some interesting features that other quiz software do not have, such as LaTeX formulas and JSON import and export. However, it is still rough on the edge, and somewhat buggy to be recommended for serious deployment. However, if a user institution is prepared to put some extra work, we would guess that polishing Arsnova to a mature state would not require major effort. Additionally, this would open up an opportunity to add API access to it!

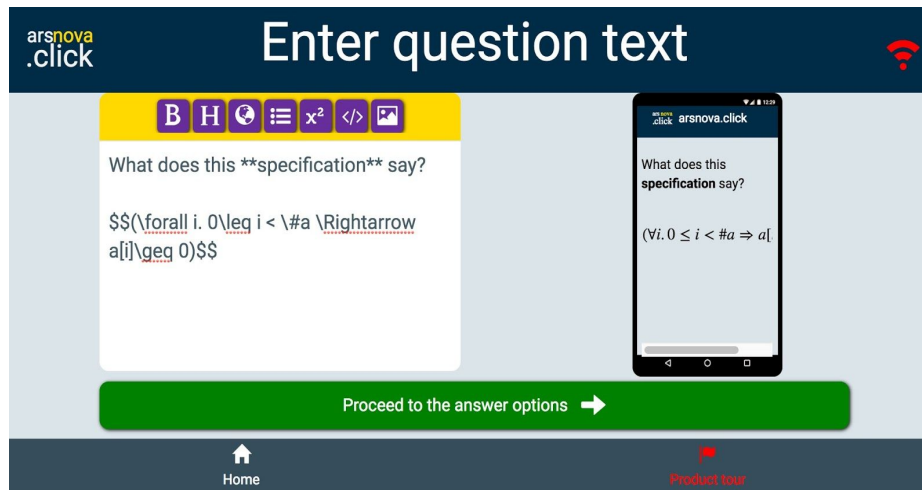


Figure: Arsnova screenshot, featuring LaTeX formula.

Functionality comparison

We will now compare the quiz software based on their functionalities. We will focus on Kahoot!, Quizziz, and Arsnova since these are the ones with the most features according to the feature-based comparison we did above.

Quiz workflow

The three quiz software offer **different workflows** when running a quiz. This can be crucial, as the offered workflow may or may not be suitable for the kind of interaction that a teacher has in mind. Both Kahoot! and Arsnova allow the teacher to pause the quiz after every question, thus enabling free classroom interaction after every question. With Quizziz this is not possible: every instance of a quiz needs to run from the start to the end (to the last question). Only then, we can have a classroom interaction to discuss the quiz. On the other hand, Quizziz can randomize the order of the questions and answers, so that it is more difficult for a participant to “peek” to his neighbors. Kahoot! and Arsnova do not have this feature.

Importing and exporting quizzes

Arsnova can import and export a quiz from/to a Json file. Being able to import would allow a quiz to be generated by another tool. Being able to export would allow a quiz to be ported to another quiz software (that has an import functionality). Quizziz can import from a CSV file, but unfortunately it cannot export a quiz¹. Kahoot! does not literally export a quiz, but the information can be extracted from its offline report. Kahoot! does not allow a quiz to be imported. Both Kahoot! and Quizziz allows a quiz' statistics to be exported to a file. They differ in the exported statistics. But in any case,

¹ Quizziz can save a quiz as a pdf file, which in theory can be parsed, but not conveniently.

Integration with other tools

Quizziz recently introduces integration with Google classroom integration.

Analytics

Kahoot!, Quizziz, and Arsnova can produce reports on the statistics of a quizz, e.g. how many people participate, how many participants provide good answers etc. The teacher can view such a report online right after the quiz e.g. with a web browser, or offline by exporting the report to files². As mentioned before, none of these software offer APIs to allow an external service access their data, so producing offline reports require manual clicks by users. Reported statistics are very basic and do not qualify as analytics³. However, in the set up where the same quiz is run multiple times (e.g. if we have multiple classes, or if the quiz is repeated over multiple academic years), exported reports can provide useful information for analytics. The table below shows the types of information available in the exported reports.

	Kahoot!	Quizziz	Arsnova
Time and date of the quiz	only date	Y	only date ⁴
Player chosen answer per question	Y	Y	N
If the player answer correctly per question	Y	Y	Y
Player's earned point per question	Y	N ⁵	Y ⁶
Time each player spent per question.	Y	N ⁷	Y ⁸
The server can save reports of multiple runs of the quiz.	Y	Y	N

² Kahoot! and Quizziz export to XLS files; Arsnova to CSV or XML.

³ **Analytics:** the discovery, interpretation, and communication of meaningful patterns in data. Especially valuable in areas rich with recorded information, analytics relies on the simultaneous application of statistics, computer programming and operations research to quantify performance.

⁴ encoded in the name of the save file.

⁵ Quizziz does not reward point per question. Performance is simply expressed as the number of correct answers.

⁶ Not available in the quiz' overall report, but the information is available in per-question report, though this has to be downloaded separately (hassle!).

⁷ This information is only available in the webbrowser dashboard, but sadly not in the exported report.

⁸ Only available in per-question separate report. This has to be downloaded separately (hassle!).

Conclusion

Most of the reviewed software are already mature and widely used. However, none comes out as the ideal choice to support University classroom teaching. If a choice has to be made, we would recommend either Kahoot! or Quizizz. If in-between classroom interaction is preferred, then Kahoot! should be used rather than Quizizz. Arsnova is an interesting option if the university is prepared to invest extra effort to stabilize it. The table below shows a “road map” to decide the choice given the functionalities needed.

	Kahoot!	Quizizz	Arsnova
Quiz can be paused after each question to allow classroom interaction	Y	N	Y
Quiz can be randomized per participant	N	Y	N
Can import a quiz from a file	Y	N	Y
Can export quiz to a file	N	Y	Y
Have APIs to pull data	N	N	build it yourself

Purpose: a software tool to write gamified quizzes to support teaching at the university level (undergrad and grad level).

MOSCOW requirements

Must have:

- [M0] Students can do quizzes. In the most simple form, a quiz is a series of questions, each offers a set of answers (multiple choice).
- [M1] Students can do quizzes live in the classroom.
- [M2] Users like teachers can construct a quiz.
- [MGraphics] There are graphics to make a quiz look “fun”, if desired.
- [MEvaluation] It supports evaluation (to evaluate how students perform on a given quiz).
- [MAward] There is an award system.
- [MANalytics] There is an analytics system.

Should have:

- [SAPI] API access
- [SFree] Free

Could have:

- [COpen] Open source

- [Csocial] E.g. can share over FB, WA, etc.

We will only consider solutions that meet M0 ... M2.

Candidates

1. Kahoot! <https://kahoot.it/>

Kahoot! is a quiz creator that allows teachers to compose gamified quizzes for their classrooms. It is very popular, with 50M active users, hosting 20M quizzes, played in over 180 countries.

Which test suite gives full pair-wise coverage of the production rules? Full Screen

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In $P(\text{String } x)$, x is to follow this grammar, with S as the start symbol:

$S \rightarrow "<" \text{ BITS } ">"$

$\text{BITS} \rightarrow \epsilon \mid "0" "1" \text{ BITS BITS}$

Skip

0

Answers

▲ { "<>", "<01>" }

◆ { "<>", "<01>", "<0101>" }

● { "<0101>" }

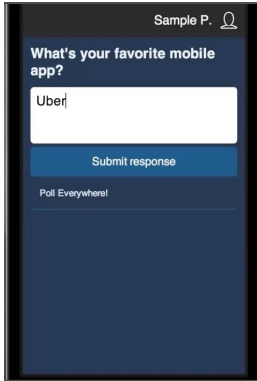
■ { "<01>", "<0101>" }

2. Directpoll: <http://directpoll.com/education/>

DirectPoll is currently for free. The basic service as currently offered will very likely stay free. There will be additional features that we plan to offer for a small fee, but what you setup now will stay free. Please note that we currently limit any poll to 500 concurrent voters. If you want to conduct bigger polls, please contact us.

3. Poll Everywhere (<https://www.polleverywhere.com>)

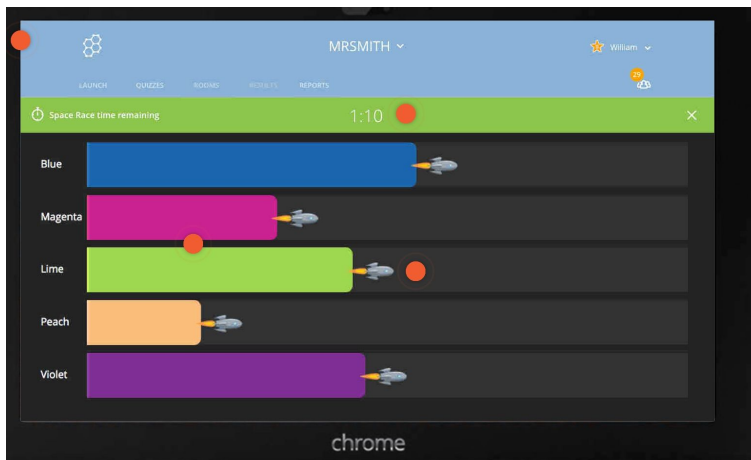
It can be launched from PowerPoint :) It is not really free; 350 USD/semester for max. 400 reponses per poll. It does allow clickable image to be uploaded, to allow for more inspiring interaction, but other than this it offers no gamification.



4. Socrative (<https://socrative.com>)

Socrative is a quite extensive quizzing platform to support an digitally interactive classroom. It looks to be quite well established and smooth. There is no gamification in the presentation of a quizz itself, but there is the rocket-race mode of the scores, which might be just enough to add some fun element into it.

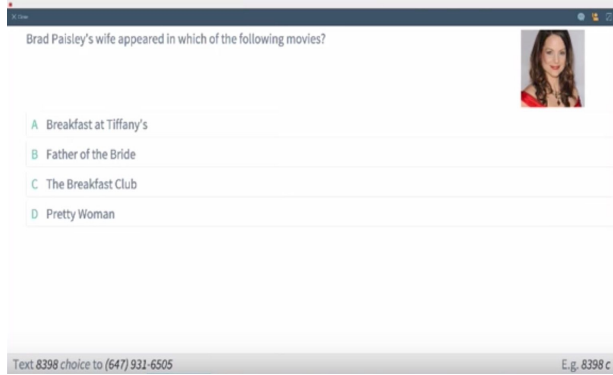
It is not free, but the price is reasonably. 60 USD/year with currently max. 150 participants per “room” (running a quizz would occupy one room).



5. GoSoapBox (<http://www.gosoapbox.com>)

6. TopHat (<https://tophat.com>)

Too expensive. 26 USD per student for one term ;| No gamification.



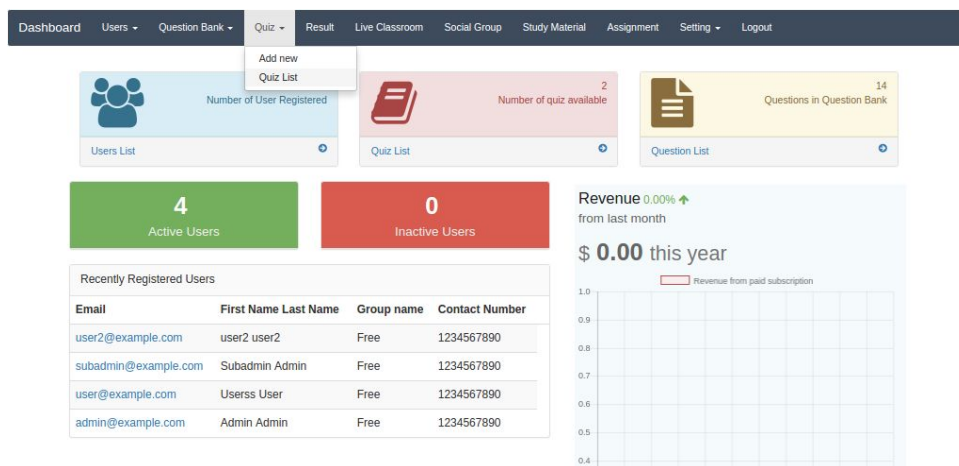
7. WebClicker (<http://webclicker.org>)

8. Quizlet (<https://quizlet.com>)

Scores and leader board. No fun graphics, though it allows a picture to be marked (multiple markers) and matched with answers. If the picture is fun, it could serve as gamification....

9. Savsoftquiz (<https://savsoftquiz.com>)

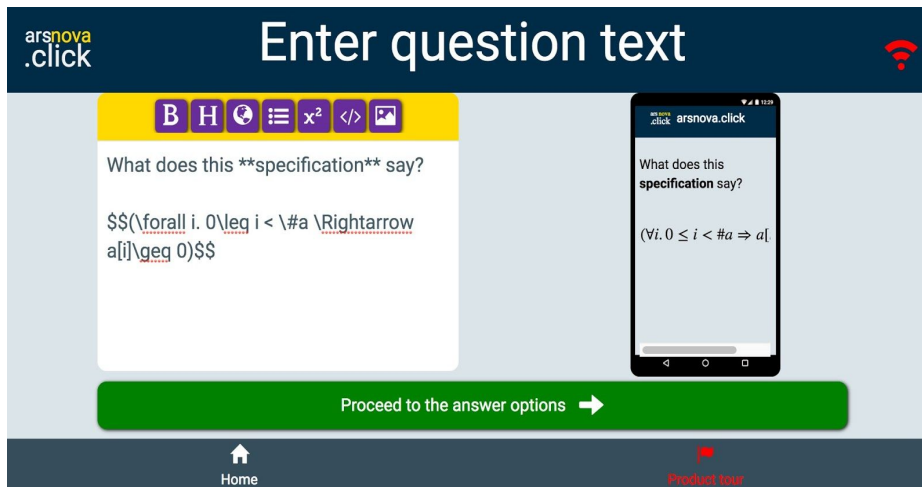
It enhances quizzing with an array of other teaching related functionalities, e.g. live class room, social group, assignments, and even a feature to organize a paid course, etc. It is not free, but is not expensive, and will then give access to its source code. It is not a gamified quizzing platform though.



10. Arsnova (<https://github.com/thm-projects/arsnova.click> (<https://arsnova.click/>))

Arsnova is open source. That is a big plus. There are also features like import/export to json, and ability to include LaTeX formulas which are cool. It is however still somewhat

beta. The UI for editing answers is not convenient; a bit buggy too (when you change the question type from MC to Survey). Also, when the quiz ends and nobody scores a 10, it will not show the ladder board, this would be a rather big disappointment for the participants.



If we decide to use this, there needs to be some development to smoothen its rough edges. (but then we would also have the opportunity to build API access for analytics)

11. Quizizz (quizizz.com)

The graphics are perhaps less catchy than Kahoot, but they are acceptable enough. It has many features that Kahoot has, but its management tool seems to be more powerful. Quizizz also recently adds Google Classroom integration.

Like Kahoot, it is free. For how long is unknown.

If we are to choose between Kahoot and this one, I'll pick this one.



Evaluation

Values :

* Binary Y/N the feature exists

* Stars (0 .. 4) : [feature does not exists, *poor , **acceptable, ***good, ****excellent]

* Fill in your own value/text if it does not fit into one of the above

		MGra (stars)	MEv (stars)	MAw (stars)	MAn (binary)	SAPI (binary)	SFree (binary)	COpen (binary)	CSoc (stars)
1	Kahoot	***	***	***	Y	N	Y	N	***
2	Directpoll	*	**	*	N	N	Y	N	*
3	Poll Everywhere	****	Free: *** Premium :****	** (only available in the Premium version)	Y	Y (RESTful API)	Free for up to 40 students	N	Feature does not exist?
4	Socrative	***	****	**	Y	N	Free for 1 session with up to 50 students	N	Feature does not exist?
5	GoSoapBox	*?	***	Feature does not exist?	Y	N	Free for up to 30 students	N	Feature does not exist?
6	TopHat	****	****	***	Y	N	N	N	Feature does not exist?
7	WebClicker	**	*	Feature does not exist?	N	N	Y, but full of ads	N	Feature does not exist?
8	Quizlet								
9.	Arsnova	**	*	Does not seem to have one	Y, very simple	N	Y	Y	N
10	Savsoftquiz								
11	Quizizz	**	***	***	Y	N	Y	N	Y