

Kwansei Gakuin University
Humanities Review
Vol. 18, 2013
Nishinomiya, Japan

Utilizing Existing Classroom Technology to Enhance Student Engagement

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Abstract

In recent years, interactive classroom learning through the use of technology such as Student Response Systems (SRS) has been examined as a means of improving student engagement within large university classes. By introducing immediate feedback on classroom material between teacher and students during class time positive effects such as improved engagement, retention and attendance have been achieved. Many of the technical functions required to create such an interactive class may already exist in a large number of university classrooms. Despite the availability of such technology, functions which can potentially boost student engagement in learning may often go unused. Reasons include a lack of teacher knowledge or confidence in using these functions, or an unawareness of the benefits to learning which they can create. Ten English instructors within a Japanese university undertook a survey to reveal their knowledge of and confidence in using existing classroom learning management system (LMS) functions to help engage their students more. The frequency with which they applied these functions in class was also examined. Results indicated a general lack of knowledge and confidence in using the system among teachers, as well as a possible neglect of the functions as interactive learning aids.

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I. Background

1. Student engagement

Student engagement at the university level has recently been shown to be positively linked to elements of learning such as critical thinking and grades (Carini, Kuh, & Klein, 2006). However, it is a concept which most teachers are familiar with, but one which is perhaps sometimes not fully understood. Engagement is not as easily defined as how much students are focusing upon their work. It is a complex state, best broken down into what Fredericks, Blumenfeld and Paris (2004) described as *cognitive*, *emotional*, and *behavioral* engagement. Cognitive engagement refers to the cognitive investment students put into their tasks. Put simply, how much effort they put into thinking about and attempting to comprehend learning challenges. Emotional engagement refers to the attitudes of students towards their tasks. A positive attitude towards doing work and enjoyment in doing it leads to emotional engagement. Behavioral engagement refers to actively participating within tasks, without being easily distracted or doing something else (Connell & Wellborn, 1991). From these definitions, it can thus be said that an engaged classroom of students is one in which students are thinking deeply about, showing positive attitudes towards and remaining undistracted from the tasks they are doing.

Additionally, knowing when a class is highly engaged is a difficult question for teachers. Simply observing and applying intuition is not enough, as it cannot reveal student thoughts or feelings (simply only observable behavior patterns). More feedback would be required for a teacher to feel satisfied that students are truly engaged. Chapman (2003, pp.1–6) gave some great suggestions for just such feedback with methods such as student self-reported surveys, observation checklists and rating scales, as well as work sample analysis. Teachers need to remain aware that when assessing the level of engagement of a class, review of all sources of available feedback are necessary to ensure students are cognitively and emotionally invested in their tasks, as well as in terms of their behavior.

2. Conditions which promote student engagement

In order for students to potentially reach a state of engagement, several situation-specific conditions are desirable. Successfully grabbing and holding the attention of students during class is one such condition. Keller's ARCS model (1987) described the important of getting the attention (The 'A' element of the model) of students in order to motivate them to focus on work. Stroud (2013) took this further and showed that observable engagement of students could in fact be increased and maintained by adjusting classroom tasks to be more attention grabbing

using attractive visuals. The importance of connecting visually with students during class-time clearly exists and is perhaps a key component of classroom engagement.

The ultimate state of student engagement in a classroom can be described as reaching a state of *flow* (Csikszentmihalya, 1989, 1994, 1997), where students are said to be in what a sportsman might call ‘the zone’. Students would feel that time is passing more quickly than they realize, as they become completely absorbed into their tasks. Csikszentmihalya detailed seven conditions required for flow to occur and they will now be examined in terms of their application for engagement:

- A perceived balance of skills and challenge—there is a need for a teacher to continuously assess student progress and adjust task difficulty throughout class time. By doing so students can remain appropriately challenged by tasks without boredom or frustration occurring.
- Opportunities for intense concentration—students must be able to focus upon their tasks without distractions such as talking to other students or noise. By creating a sense of curiosity and interest in work, students can focus upon work in a state of cognitive, emotional and behavioral engagement.
- Clear task goals—clarity in what is expected in terms of outcome from students can clearly give them more focus upon their goals and create a more focused and engaged learning environment.
- Feedback that one is succeeding at the task—providing immediate and helpful feedback to students can enhance the amount of effort and attention they invest in classes.
- A sense of control—Giving students options and decision making power has the potential to motivate them to participate more and think more deeply about their choices.
- A lack of self-consciousness—Allowing students to communicate anonymously and without negative consequences will promote a willingness to communicate and participation in tasks.
- The perception that time passes more quickly—a resultant feeling of absorption into classwork is a desirable outcome with appropriate conditions in place to aid high levels of engagement.

The desirable conditions to promote student engagement detailed above can often be met using classroom technology often readily available to teachers. Examples of such technology will now be explored.

II. Existing Classroom Technology

One form of technology recently being used (across a range of fields) to

enhance student engagement is Student Response Systems (SRS). They are often referred to as clickers and work much the same way as the devices audience members on the game show ‘who wants to be a millionaire’ are provided with. When a question arises in class, students are asked to offer their answer, usually with a multi-choice option. This interactive involvement of students (as opposed to one-directional lecturing in a more teacher-centered environment) has been shown to create significant improvements in learning. As well as raised levels of student engagement in class, SRSs have been shown to improve student retention, enjoyment in learning and even attendance levels (Draper and Brown, 2004; Hinde and Hunt, 2006; Stowell & Nelson, 2007). Students in a study by Hall, Collier, Thomas and Hilgers (2005) stated that clickers helped them stay awake, pay attention and get involved more because they knew questions were coming. Such devices show great potential for enhancing learning in a more interactive classroom environment and should not be overlooked by teachers in any field of study. However, functions similar or identical to SRSs often already exist in computer-assisted classrooms. Moreover, some learning management system (LMS) functions can actually surpass SRSs in terms of engaging students and eliminate technical issues that devices such as SRSs may have. For example, existing computer systems often require no extra hardware in order to function in much the same way as an SRS, saving on cost, complexity of set-up and potential damage to additional devices within large classes. Additionally, students can type longer and more complex answers more easily on a keyboard when using a computer, rather than giving responses on a clunky or input-limited clicker device. Finally, teachers and students would require far less training and familiarizing with a system which already exists in a class, rather than adding another layer of complexity to the teaching and learning process.

Table 1 Engaging elements of available LMS functions

Engaging element	Messages	Multi-choice surveys	Text-answer surveys	Quizzes
1. Arouses interest and curiosity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Grabs attention	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Creates higher levels of concentration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Gives immediate feedback to students	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Gives immediate feedback for teachers		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Allows anonymity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Gives students control in answers		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Creates clear goals		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Promotes deeper thinking on learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Extrinsicly motivates to keep face			<input type="radio"/>	<input type="radio"/>
11. Maintains higher levels of attention in class				<input type="radio"/>

Four such simple interactive classroom functions which many LMSs have readily available in the classroom are detailed below. Table 1 summarizes eleven potential conditions which can be met with each of the functions in order to promote student engagement in class. These conditions are summarized from past research on engagement by Stroud (2013) and Csikszentmihalya (1989, 1994, 1997), as well as findings from other recent research detailed below.

A brief description of each function in terms of practical classroom applications and their potential benefits to classroom learning will now be given. Numbering within the text refers to points within table 1:

1. Screen Messages (see appendix 2 a).

Example task: Students are given a paragraph and asked to find and highlight the grammatical mistakes within it. Whilst students are undertaking the task, the teacher can use computer screen messages to send additional information to the class as a whole, or to specific individuals. By monitoring student progress (teachers can often view student screens in real-time with an LMS) the teacher can select which students require additional information to either increase the difficulty of the task (giving them an extra challenge, such as highlighting different grammatical error types with different colors) or lower the difficulty level (by giving clues as to the whereabouts or types or errors in the text).

Benefits to learning: Messages appearing on a student's screen can grab the attention of a student (2), especially when the message is personalized (in a large class where they may not get one-to-one attention from the teacher very often). As Stroud (2013) showed, grabbing the attention of students with carefully designed tasks using good visual stimuli is likely to result in higher levels of student engagement through higher levels of concentration (3) and deeper thinking (9). This immediate feedback (4) from the teacher to students is much faster than just walking around a large classroom and speaking to students and can add to engagement levels without the need for addressing individual abilities in front of others (6). Students can feel supported by the teacher and the challenge level of the task can be adjusted appropriately for each student. This is necessary to ensure students do not feel bored with a low level of challenge or frustrated with one which is too high (Przybylski, Rigby & Ryan, 2010) and that they are kept highly engaged in their tasks (Rani, Sarkar & Liu, 2005), much the same way as a video game might work (by keeping the game difficulty level at the right level to keep the person playing).

2. Multi-choice surveys (see appendix 2 b).

Example task: Students are shown a sentence and asked to choose the correct missing word from a list. This task works in much the same way as how SRSs

would be used in the classroom, with students selecting multi-choice answers by clicking a button. Class results can be shared (as a class poll result) and can even be sent to individual student monitors.

Benefits to learning: Immediate class surveys can arouse curiosity and interest amongst classrooms of students (1) by giving them the power of decision making (7) with a clear goal in mind (8) of selecting the correct answer. This attention grabbing (2) can motivate students to participate more in the task with less distractions (3) and the immediate anonymous class results (6) can act as feedback to let students know if they are succeeding or not in their learning (4). By doing so, students who are perhaps not selecting correct answers will think more deeply about their learning (9) and invest more effort in the areas they do not fully understand (Beatty, 2004). In addition, such survey functions can serve as a very fast method of running a class comprehension check. A teacher can quickly assess whether the majority of students present in class understand the questions being asked (5) and can adjust the challenge difficulty as required (to either move forward with teaching more quickly if all the students found the question too easy, or repeat teaching if many students selected incorrect answers).

3. Text-answer surveys (see appendix 2 c).

Example task: Students are asked to write a full sentence reply to a question. Answers are typed into the system via student keyboards and collected by the teacher. Answers can then either be kept anonymous or labelled with student names, and even distributed back to students in the class to compare answers with peers.

Benefits to learning: Text-answer surveys share much of the same benefits associated with multi-choice surveys previously mentioned. However, students answering surveys with a full sentence as opposed to choosing a response from a list face higher levels of pressure. Kennedy and Cutts (2005) showed a deeper processing by students in learning when they have to give correct answers in an interactive class, rather than just listen to a lecture. This was explained in turn to lead to students reflecting more upon the material at hand, relating it to things they already know and building new associations. This kind of deeper thinking by students (9) whilst giving full-sentence answers to class surveys can clearly lead to higher engagement in and perhaps retention of material. An additional option available with full-sentence survey answers for teachers is labelling answers with student names. Although Csikszentmihalya's conditions for flow to occur include a lack of self-consciousness for students, the sharing of individual student answers to a class question (displayed on each student's screen for example) can be argued to be beneficial to learning in some cases. This added extrinsic (doing something because it leads to a separate outcome) rather than intrinsic (doing something

because it is interesting or enjoyable) (Deci and Ryan, 1985) motivation of pressure to maintain 'face' in class (10) can be viewed as a negative by some. However, the option of giving students accountability for their answers in front of their peers is available for teachers, should they choose to use it as a source of motivation for engagement.

4. Quizzes (see appendix 2 d).

Example task: Students answer five on screen multi-choice questions related to the material taught in the lesson just given. The teacher and students can receive immediate feedback on their scores and even see how they rank in the class.

Benefits to learning: Class quizzes have many of the same benefits as multi-choice surveys (as already discussed) in terms of creating clear goals (8) with quiz pass grades for example, giving decision making power to students (7) with multi-choice or text answer questions, and giving students feedback on if they are succeeding or not in learning (4) with their scores. Quizzes also have the ability to create a chance for intense concentration for students (3) with silent, test-like environments, as well as giving teachers the chance to adjust content difficulty and challenge to an appropriate level if class quiz scores are higher or lower than expected (5).

Draper (2002) showed how such quizzes can ensure students are paying attention with note taking throughout class (11), preparing well for lectures, actively thinking during class (9) and successfully recalling material from previous lectures. This suggests that quizzes do in fact create more engaged classroom environments. This was further backed up by Knight and Wood (2005) who showed there are distinct learning gains and better conceptual understanding for students when teachers use frequent in-class assessment of understanding (rather than just lecture continuously without student interaction). The incorporation of quizzes into learning is clearly a simple and effective way to engage students and should therefore not be overlooked by teachers.

III. Teacher issues

Although functions such as those described above may be available for use within classrooms, they may often go unused as tools to enhance student engagement. Three main issues exist which prevent their utilization by teachers. The first is concerned with teacher training. Without proper training on how to run specific functions on whatever system may be available in class, teachers cannot be expected to harness their capabilities as teaching aids. Without knowing how to use the system from the beginning of a course, a teacher is less likely to invest time in

using technology not incorporated into their original syllabus plan. The second issue is a matter of confidence in using the technology itself. Without receiving training (as just mentioned) teachers cannot be expected to confidently apply functions in their classrooms and may well avoid using them altogether. Lastly, a lack of understanding of the potential of classroom technology to improve and maintain student engagement will of course limit its degree of application in class. A teacher who doesn't understand the positive effect which past research has shown for student response systems (SRS) for example (as already discussed) is far less likely to use such functions than a teacher who is aware of the benefits. Again, this is a matter of training for teachers.

IV. Method

1. Participants

The study participants were ten teachers of English as a foreign language within a science and technology department at a university in Japan. The teachers taught combinations of 90 minute English reading, writing and communication classes. Class sizes varied between 24 and 40 students studying in their first, second, third and final year of university. The teachers used classrooms which had a learning management system (Calabo Ex) with all of the functions mentioned above available for use on it.

2. Research question

Two questions were approached with regards to the teachers:

- How confident are the teachers with using the existing learning management system?
- How often do they attempt to use the available system functions to improve student engagement in class?

3. Data collection

Data was collected via a two-part six-item survey distributed to the teachers online (see appendix 1). The first part asked teachers about their confidence and general frequency of use of the learning management system as a tool to engage student. The second part asked more specifically about the frequency of use of the four different available functions (messages, multi-choice surveys, text-answer surveys and quizzes) as tools to help engage students in their learning. An explanation of exactly what was meant by engagement was given to each teacher prior to undertaking the survey, based upon the definitions within this paper. The survey responses were collected and used to formulate the results below.

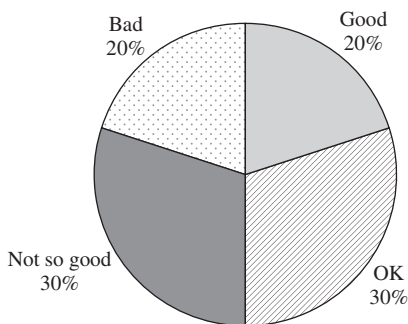
V. Results

As can be seen in graph 1, confidence in using the LMS can be said to be reasonably low, with only 20 percent of the teachers saying that their ability to use the system is anything more than 'O. K'. In actual fact, 50 percent went as far as to answer that their ability is either not so good or very bad.

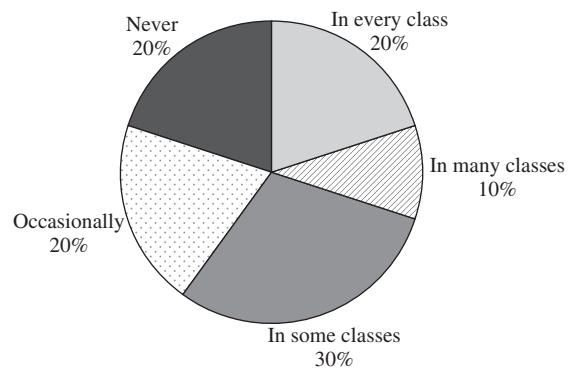
The frequency with which teachers feel they use the LMS as a tool to engage classes was a little less clear cut, with graph 2 showing that 30 percent of teachers stated that they use it in many or every class, but 40 percent saying they only occasionally or never use it. The reason for these differences cannot be explained here, but the fact that differences in the frequency of use of the same engaging system functions available to the same teachers exists is apparent.

Graphs 3 to 6 show a breakdown of the frequency of use of the four available functions to all of the teachers in their classes. As can be seen, every one of the functions was said to be 'never' used by at least 60 percent of the teachers. Only the message function was said to be used in every class to engage students (but only by 20 percent of the teachers) and most of the functions appeared to be going very much unused as student engaging tools for learning.

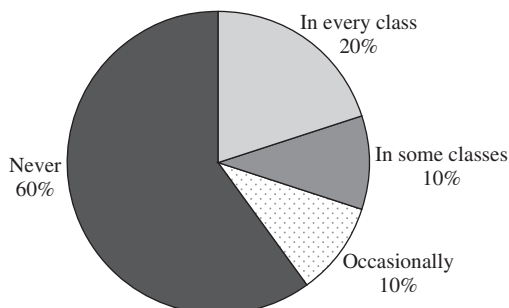
Graph 1 Teacher ability to use the LMS



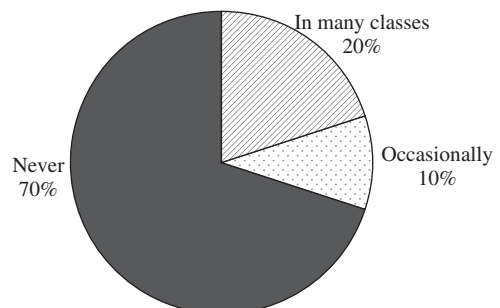
Graph 2 Use of the LMS to engage students

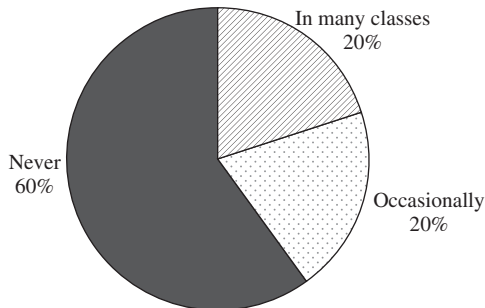
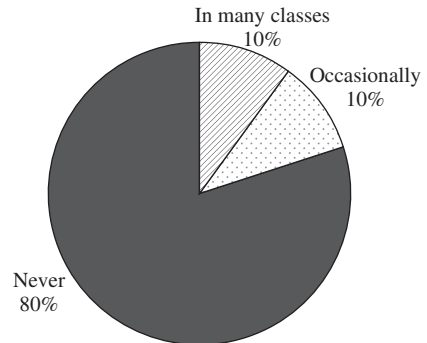


Graph 3 Frequency of use of messages



Graph 4 Frequency of use of multi-choice surveys



Graph 5 Frequency of use of text-answer surveys**Graph 6 Frequency of use of quizzes**

VI. Discussion and Conclusion

The benefits available to teachers of using technology (which may well already exist in their classrooms) are apparent from past research into student engagement, attendance and retention of class material for example. Students can become more focused upon class work and involved in deeper thinking towards content in a more interactive classroom environment through the use of simple technology. Despite the availability and simplicity of use of computer system functions (such as sending messages, holding class surveys, or running short quizzes) this paper has shown the potential for neglect of such functions by teachers in university language learning settings. Teacher confidence and frequency of use of an available learning management system's functions were found to be significantly low amongst language teachers surveyed in a Japanese university. These results served as an example of how teacher training is essential if available technology is to be used appropriately to highly engage students in their classwork. Past evidence discussed in this paper has shown that interactive classrooms do in fact exhibit higher levels of engagement, and improvements in student classroom results. Through teacher training and encouragement of use with available technology, similar results can surely be recreated in other institutions. Following this, teachers should take the time to gather feedback from sources such as student surveys, observation schemes and work samples on student engagement due to the use of available technology. Using this data teachers can broaden their understanding of and confidence in its effectiveness as a catalyst for classroom learning.

Furthermore, continued research into the concrete impact which such applications of existing classroom computer functions can have on learning is required. Evidence of the exact effects of functions such as class surveys and quizzes on language learning for example is very limited. By revealing and presenting proof of their impact on classroom learning, doubts about their necessity

as classroom tools can be cast aside and they can be incorporated as useful aids for teachers.

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Appendices

1. Teacher survey

My ability to use Calabo Ex functions in the classroom can best be described as:

- a) Very good
- b) Good
- c) OK
- d) Not so good
- e) Bad

I try to use Calabo Ex functions to keep students engaged in their classwork:

- a) In every class
- b) In many classes
- c) Sometimes
- d) Occasionally
- e) Never

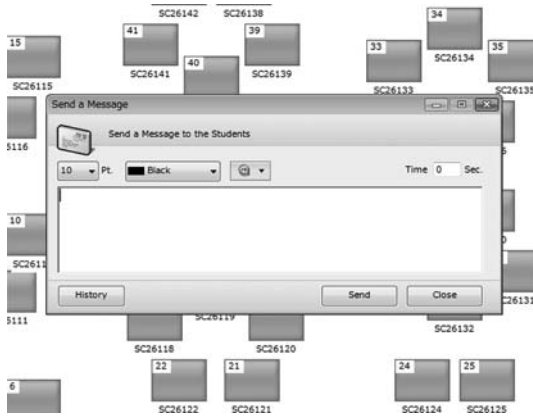
I use the following functions in my class to engage students:

(Please answer either ‘in every class’, ‘in many classes’, ‘in some classes’, ‘occasionally’, or ‘never’)

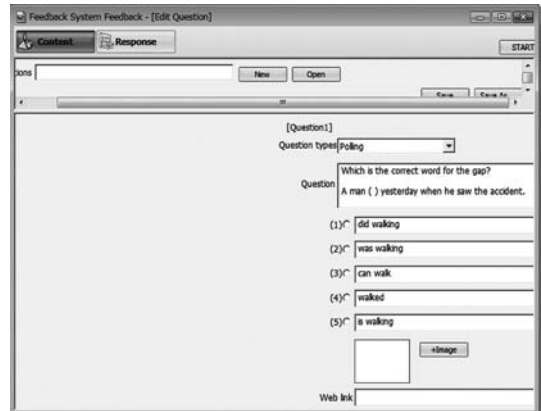
- Send messages
- Run multi-choice class surveys
- Run text-answer class surveys
- Run class quizzes

2. Learning Management System (Calabo Ex) screen shots.

(a) Sending messages



(b) Running multi-choice class surveys



(c) Running text-answer class surveys



(d) Running class quizzes

