INTRODUCTION

How do you help a prospective client to evaluate what language lab management system is best for their needs? Well, in a perfect world, you start by asking questions about the client's environment and the activities that the language teachers want to conduct with the system.

That sounds logical and relatively easy, but in practice it is actually quite difficult. It is difficult because language teachers are not *techies,* and often do not have a detailed understanding of what they need and of what is technologically feasible.

So, what do we do?

Our mission is to educate our prospective clients about language lab management systems. We need to explain capabilities clearly, so that the client can make educated choices regarding the various options available to them.

Begin with the basics: For a system to be truly beneficial, it must:

- Be easy to learn and to operate
- Support the key listening & speaking activities teachers want to run extremely well
- Provide a simple means for evaluating and giving feedback to students

In this document, we will explain why "feature checklists" do not work for comparing products, and why ease-of-use is always much more important than clogging a system up with marginal features that few teachers will ever use.

We will also explain in detail how differences in system capabilities, (such as software-based intercoms and hardware-based intercoms), impact the activities that teachers need to be able to run.

Throughout this document, we will use our new SmartClass + language lab management platform as a reference point for discussions.   We explain some of the choices that we have made in implementing SmartClass +, and relate why these choices are important for teachers when evaluating competing solutions.

THE ANATOMY OF SmartClass +

The block diagram below provides an overview of the architecture of SmartClass +. Study this diagram for a few minutes, because for many of the key points in this document, we will refer back to specific system options and differences in our architecture compared to most competing products.
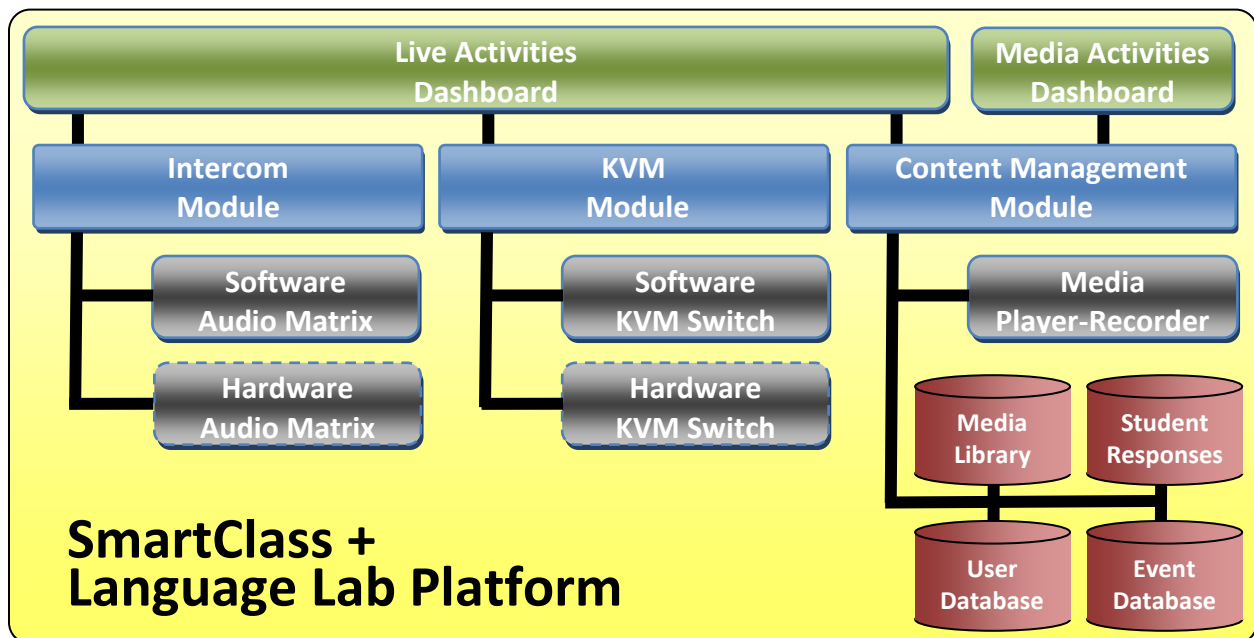
Dashboard – the dashboard is the graphical user interface the teachers and students will use to interact with the system. SmartClass + and most of our competitors have two different dashboards, one for running live activities in a classroom, and one for running media activities either in the classroom or on a self-study basis.

Intercom Module – this is module that teachers use to communicate orally with their students when monitoring student work or speaking with students. This same module is used to organize students into pairs or small groups to practice speaking with their peers.

KVM Module – the KVM module is used for sharing screen information among workstations. For a presentation, the teacher will broadcast his screen to all student monitors. When monitoring student work, the teacher will view a student screen on his own monitor.

Content Management Module – the content management module enables teachers to define classes, to populate those classes with a list of students, to import, create, and organize media content & self-study activities, to store and organize student responses, and to evaluate student responses and provide feedback to students.

COMPARING COMPETITIVE OFFERINGS

If you are expecting to see a checklist of features for SmartClass + and competing products, then you are going to be disappointed. We are not using the checklist approach, because it is the wrong way for us – and for prospective clients – to compare competing language lab systems. In our experience, a simple checklist of features/capabilities can make terrible products appear to be quite good and conversely, can make excellent products appear to be only mediocre.

THE PROBLEM WITH FEATURE CHECKLISTS

The problem with the checklist approach is threefold:

1. ***The devil is in the details:*** Most checklists do not include any detailed analysis of product features, so that a checkmark beside a capability called *Intercom* does not really identify key issues like audio quality and the specific audio sources supported by the intercom function.

2. ***All checkmarks are not equal:*** Checklists do not apply any sort of relevant weighting to different features, so that a check for "file transfer" appears to have the same importance as a check for "audio pairing", while in reality audio pairing is critical and file transfer is almost insignificant.

3. ***Simplicity is better than unused features:*** Most people might expect that the product with the most checked boxes has the most features and is therefore the best. However, this does not take into account the fact that as one adds features (especially marginally useful features), one also adds complexity – and as most language teachers are technophobes, simplicity is often the most important system characteristic.

USING ACTIVITIES AS THE BASIS OF COMPARISON

So, if we are not using "features" as the basis for comparison, what are we using? We are using "activities"! The optimal way to compare competing systems is by looking at how they support critical teaching activities – like monitoring student work

Yes, checklists are easy, but when you make the time and effort to really understand – from a design and operational perspective – exactly how we compare with our competitors when running specific activities, you will discover that in most environments, SmartClass + is going to blow the competition away.

COMPARING SYSTEM DASHBOARDS

As you look at the SmartClass + dashboards that follow, consider that: Teachers need to be comfortable with the system dashboard. The dashboard must provide a pleasing user experience. If you do not like to touch it, you won't. If you do not touch it, you will not operate it. If you do not operate it, then it is useless.

Apple, whose iPhone, iPod, and iPad products have helped to establish them as one of the leaders in the consumer electronics marketplace, offers the following dashboard guidelines:

a) ***Avoid feature cascade:*** It can be very tempting to add features that aren't wholly relevant to the original intent of the system. This feature cascade can lead to a bloated interface that is slow and difficult to use because of its complexity. Try to stick to the original intent of your design and include only features that are relevant to the main workflow.

   The best products aren't the ones with the most features. The best products are those whose features are tightly integrated with the solutions they provide, making them the most usable.

b) ***Apply the 80% solution:*** During the design process, design your system to meet the needs of at least 80 percent of your users. This type of design typically favors simpler, more elegant approaches to problems.

   If you try to design for the 20 percent of your target audience who are power users, your design may not be usable by the other 80 percent of users.

Robotel SmartClass +

Live Activities Dashboard (Teacher View)
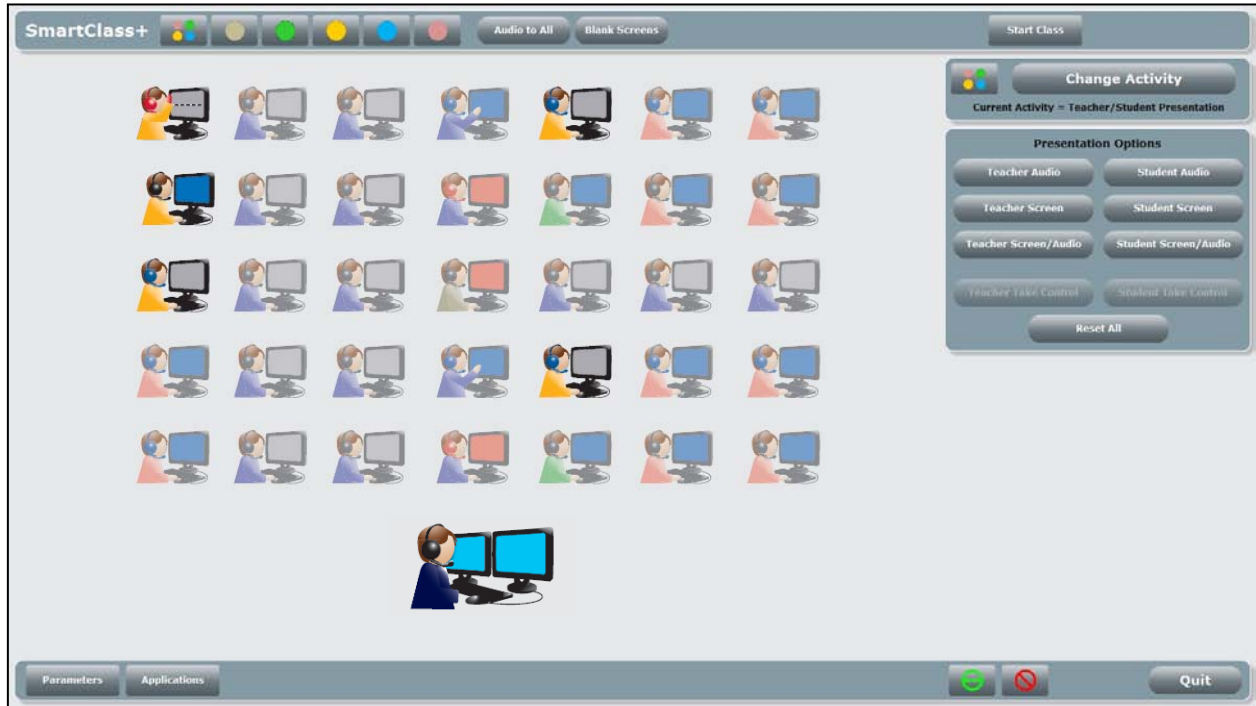
Media Activities Dashboard (Student View)

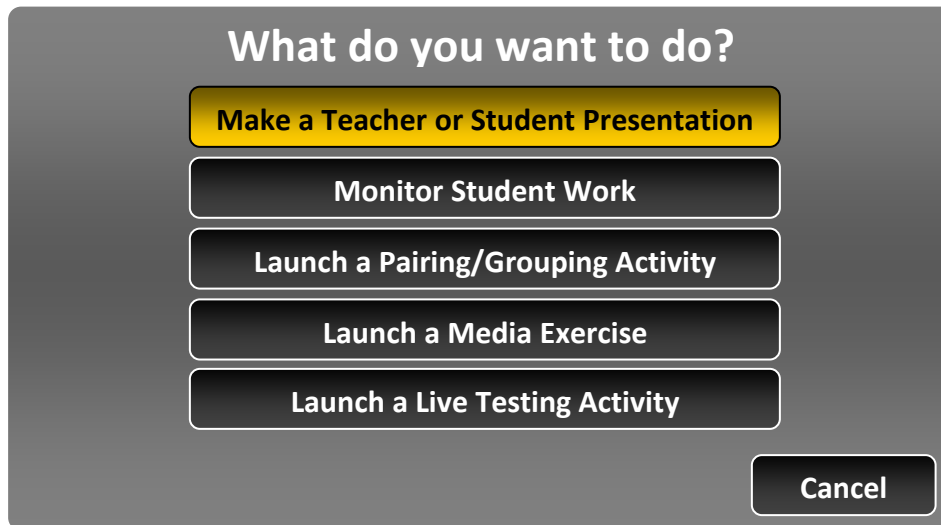**Assignment View**

Media Player View

The SmartClass + System Dashboard

In developing SmartClass +, we have adopted the *Apple way*, and have kept the user interface visually pleasing, easy to understand, and simple to operate. We have consciously avoided having unnecessary buttons on the screen when they are not needed, we have avoided having techie-style drop-down menus, and for complex activities, we have used a wizard approach that breaks down the teacher's job into a simple step-by-step process with only a few uncluttered options at each step.

Visually pleasing & easy to understand: The new system dashboard has a modern streamlined look. Icons for student stations include an avatar for the student as part of the icon, and have seamlessly integrated station information such as section membership conveyed through the avatar's sweater color – rather than by tacking on external boxes with uncertain meanings.

Simple step-by-step processes: When a teacher first accesses the SmartClass + Live Activities Dashboard, he or she is greeted with the "What do you want to do?" menu shown below. All other screen controls are grayed-out until the teacher makes a selection.

What do you want to do?

Make a Teacher or Student Presentation

Monitor Student Work

Launch a Pairing/Grouping Activity

Launch a Media Exercise

Launch a Live Testing Activity

Cancel

Simple presentation with no drop-down menus: Only those buttons associated with the current activity are displayed in the main menu. There are no drop-down menu options to make non-technical users uneasy.

Competitive System Dashboards

We have recently installed a couple of competitive systems in our training room, with the intent of putting them through their paces. Although we have years of experience in working with language lab management systems, we found it very frustrating to try and guess how to perform even basic functions like having a two-way conversation with a student. This is because no system dashboard is completely intuitive, and many hide critical functions in obscure drop-down menus.

Drop-down Menus

One friendly reviewer of a competitive product has commented: *"the broad range of functions available within [this product] has its downside in the learning curve needed to master them all."*

Unnecessary Screen Clutter

One way to overwhelm infrequent system users is to load up the screen with controls that may only be used by a few power-users on an infrequent basis.

Single Window Integrated Access to Media Activities

When students are working with media activities, ideally they want to have all of task-related information sources integrated for them in a single window, with a single navigation scheme. Many systems have separate windows for different features, and different navigation schemes for each window!

COMPARING SYSTEM INTERCOMS

SmartClass + is the only language lab management system that offers schools the choice between a hardware-based and a software-based intercom system. We have a software-based intercom implementation that is at the very least the equal of the best of our competitors, and we have a hardware-based intercom solution that significantly outperforms all of the competition in terms of audio quality and functionality.

Overall Audio Quality

Before looking at how the Intercom system impacts some basic teaching activities, let us first make an observation about the difference in audio quality between software-based and hardware-based solutions.

Because software-based intercom modules must first digitize and then reconvert sound sources back to the analog domain, some degree of delay is introduced into the received signal. If two participants are speaking through the intercom module, the listener will hear the speaker a fraction of a second later than real-time. If the two participants are separated sufficiently, (as with a cell phone conversation), then a slight delay does not pose a problem.

However, if the two participants are in the same room and are able to hear the speaker both acoustically in real-time and electronically with a slight delay, then this will result in a disturbing echo effect for the listener.

Also, if the headset microphones being used have a wide pick-up pattern, (as is commonly the case), then the original speaker will hear his own voice in real time, (e.g. sidetone), and a delayed version of his own voice picked up by the listener's microphone.   This causes a very disturbing echo for the speaker. At best, this echo might be described as a head-in-a-tin-can effect, and at worst is can become an uncontrollable reverberation.

Conflict with 3rd Party Applications

A software-based intercom implementation will manipulate the sound card settings in the classroom computers in order to establish the best possible communications. However, other 3rd party software applications (e.g. Skype, Tell-Me-More, etc) will also manipulate sound card settings for their own needs.

It is possible for the intercom to interfere with the proper operation of some 3rd party applications, or conversely, it is possible for the 3rd party applications to interfere with the intercom.

Activity 1 - Monitoring Students

Imagine that a student is listening to a media file and the teacher wants to monitor the student.

Some software-based systems only allow the teacher to monitor the student's microphone, but not the computer audio source to which the student is listening. To avoid this issue, competitors will sometimes sell the client an external USB sound card for all stations.

The better software-based products will enable the teacher to monitor both the student's microphone and the computer audio. However, no matter how good the system implementation, it is not possible to monitor both the student's microphone and the computer audio when the student is recording. When the student is recording, the teacher only hears the student's voice when monitoring. This can certainly be a major issue for teachers.

Activity 2 - Speaking with Students One-on-One

If the teacher wants to intervene and speak with a student that he has been monitoring, the student and teacher are able to speak with each other, but neither the student nor the teacher will be able to hear the computer audio when using a software-based intercom module.

Of course, when using a hardware-based intercom, it is possible to hear both the student's microphone and any audio sources playing on his computer.

Activity 3 - Student Pairing

Now imagine that the teacher is going to run an audio pairing activity where students are holding a conversation with a partner.

As discussed for the teacher-student intercom function, the student-student intercom function does not allow the student pairs to hear any computer audio sources that might be playing on their workstations when using a software-based intercom module.

The teacher may also want students to record their conversation, but with a software-based intercom system, each student can only record his side of the conversation. It is not possible to record his partner.

With a hardware-based intercom system, students will hear each other's microphone and any audio sources playing on their computers. Also, when recording the teacher can choose to have students record only their own audio or also that of their speaking partner(s).

Competitive Systems

Almost none of the competitive systems being marketed today for computer-based language labs offer a hardware intercom option. (The only known systems – other than SmartClass +, are designed for environments where students are not equipped with computers.)

This means that all of our major competitors, in addition to having general audio quality issues, also have some significant limitations for activities such as monitoring students, talking with students, and pairing students.

Remember at the outset when we said "don't use a checklist approach"? Putting a check beside "Intercom" does not really help to flush out the details of what can be monitored, how this will affect pairing, and how it will impact overall audio quality.

COMPARING SYSTEM SCREEN SHARING

All competing systems use software-based screen sharing.   SmartClass + is the only solution that offers options for either software-based screen sharing or hardware-based screen sharing.

So, from a competitive perspective, this means that we can supply SmartClass + with a software-based KVM module that provides the same performance as the best of our competitors, or we can provide a hardware-based KVM module that provides consistently excellent video quality no matter what content is being viewed.

An Introduction to Software-Based Screen Sharing

Most modern computer systems are configured to provide a screen resolution of at least 1280 x 800, and are configured to display a 32-bit color palette designed for displaying smoothly-shaded graphics without any pixelization. As a minimum, the display will be refreshed at least 60 times per second, (60 Hz), to avoid perceptible flicker. If you do the math, this means that the computer is sending the equivalent of roughly 2500 megabits/second of display information to its local monitor.

With a software-based KVM module, however, all information shared between stations must be routed through the local data network, (LAN), and in most schools, the bandwidth of a wired LAN connection is 100 megabits/second. But, we need to remember that LANs have some overhead, so the full bandwidth is not available. Most software-based KVM systems will try to keep the shared video bandwidth under 5 megabits/second

So, how do you fit 2500 megabits/second of data into a 5 megabits/second pipe? And the answer is, you don't! Instead, software-based systems will restrict the resolution, or the color palette, or the refresh rate, or a combination of the three to scale down the data stream to a manageable level. And remember, to allow some margin for network overheads, we are talking about scaling down the data by about 500 times!

Fortunately, modern computers are pretty fast. This means that you can scale the data down significantly in a *lossless* fashion, meaning that the observer will not be able to detect any difference between the received image and the transmitted image. That being said, even the best data compression algorithm running on a relatively hot computer cannot scale down the data by 500 times in a lossless fashion.   The lossy compression algorithms used in most software-based KVM systems are configured to reduce the overall screen refresh rate.

In practice, if you have a mostly static display, (e.g. Word or Excel), then software-based KVM modules will provide perfectly adequate video quality when sharing screens.   If you are running high-resolution graphics, 3D shaded images, and/or video-based media clips, then the received image will become very choppy (at best) or will not be displayed at all (at worst).

An Introduction to Hardware-Based Screen Sharing

Hardware-based KVM modules use dedicated VGA (analog) or DVI (digital) interfaces and dedicated cabling to share video between stations. There is no compression of any kind, so the screen of the receiving station is exactly the same as the screen of the transmitting station independent of what content is being displayed.

Activity 1 – Giving a Presentation

With a software-based KVM option, the fidelity of the images that students receive will be a variable that depends on the information on the screen being shared. Static documents like spreadsheets and text can be shared with complete fidelity, while images using rich-media content like high-resolution graphics and/or motion video will be very choppy.

Note that some systems include a separate multicast engine that can be used to share digital video clips and/or analog video sources for a presentation.

With hardware-based KVM modules the received images are virtually indistinguishable from the transmitted image, no matter what the content.

Activity 2 – Viewing Student Screens

Just as when giving a presentation, the viewing of student screens will be subject to the same restrictions regarding on-screen content. Viewing of students running rich-media applications can be choppy when using a software-based KVM module.

With a hardware-based solution, images are reproduced with no delay, with a full color palette, at full resolution, and without any degradation of the image refresh rate.

One benefit of the software-based approach is that it is possible to view a mosaic display of a group of student stations concurrently.

AN INTRODUCTION TO CONTENT MANAGEMENT

SmartClass + includes a Content Management Module that enables users to import media files, digitize new content, build exercises, organize assignments, keep track of classes, manage system users, store student responses, deliver teacher feedback, and capture system related events.

And one of the significant accomplishments of the SmartClass + implementation is that the same information database is shared between the Live Activities Dashboard and the Media Activities Dashboard.

If an authorized student needs to access an exercise that has been assigned to his class, the student accesses the exercise directly from a central server. And when the student is finished with the exercise, his response will be stored on that same central server, where it can be reviewed by the teacher.

Building Media Activities with SmartClass +

With the SmartClass + system, teachers build media activities using the Media Activities Dashboard. Activities are organized according to courses and classes: For example, the course might be English 101, and the class might be section A. To help teachers manage content, the Media Activities Dashboard uses three sliding panels:

- *Acquiring Documents and Building Exercises*: The Documents panel displays the media files and exercises for the current course & class.

- *Organizing Exercises:* The Organize Exercises panel enables the teacher to group exercises into modules called sessions, which correspond to weekly class sessions.

- *Assigning Exercises to Students:* The Assigned Exercises panel reflects which sessions and exercises have been assigned to the students.
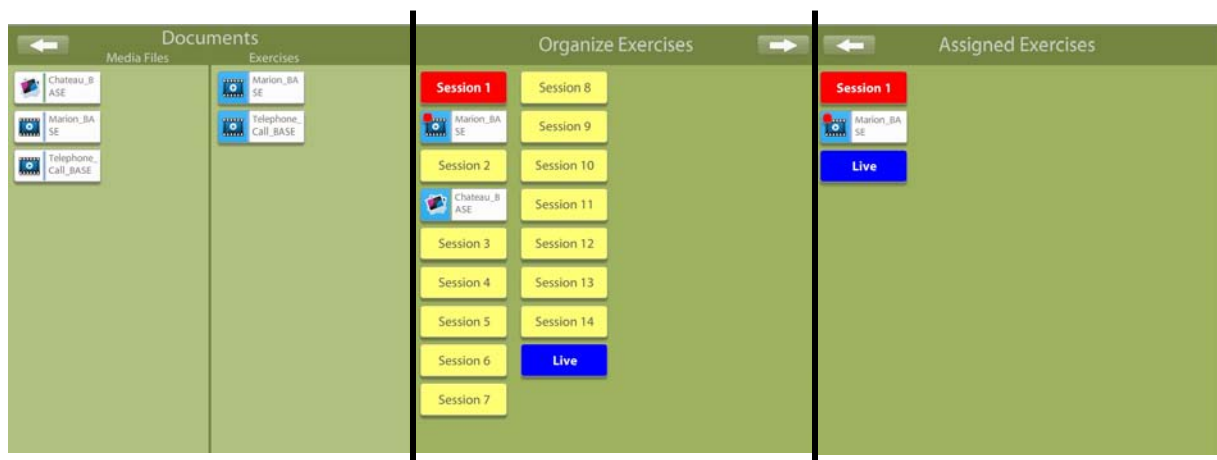
Media Files & Exercises:

Activities start with media files, such as audio clips, video clips, images, and text documents using a variety of file extensions. Teachers are able to import existing digital media files, and/or digitize their own audio clips, and/or author their own text documents.

SmartClass + encapsulates the media files plus all of the related activity instructions into a structured entity called an *Exercise*. Exercises include details about the specific activity (e.g. simultaneous recording, repeat-after-me recording, open writing assignment, multiple-choice quiz, etc), written instructions for students, segmentation & captioning information for media files, and details like student response times.

Because exercises are entirely self-contained, they can be executed in class with the teacher present, or they can be executed in a self-study fashion when the students are working on their own outside of the lab.

To simplify the process of building exercises, SmartClass + includes a set of templates for all exercise types, and an Exercise Wizard guides teachers through the process of exercise building in a simple step-by-step fashion so that nothing is forgotten, no mistakes are made, and the process is easy to master.

Also, if the same teacher has more than one class for the same course, (English 101 A and English 101 B), then the media files and exercises are automatically made available for each class.

Organizing Exercises:

To add an exercise to the Organize Exercises panel, the teacher just grabs it with his mouse and drags it into one of the sessions. In effect, as the teacher organizes the exercise, he or she is building a course syllabus for multimedia activities. If the teacher has the same course a year later, all the work has already been done!

Assigning Exercises:

Teachers just click on the Session header to assign the session (and all associated exercises) to the class. In the diagram on the previous page, Session 1 has been assigned.

The Assigned Exercises panel is essentially the view that students have when they login to SmartClass +.

Building Classes with SmartClass +

The Media Activities Dashboard includes a 4th panel, called Students (shown at right), which is used in to build classes.

Student records can be manually entered one-by-one, imported from CSV-delimited class database list, or automatically linked to a school's on-line LDAP directory.

Classes can alternately be built in a rapid fashion from the Live Activities Dashboard by defining a new course/class and having students login to populate the class.

Following-up on Student Assignments

When a teacher connects to the Media Activities Dashboard, his default view is of the Assigned Exercises and Students panels, as shown at right.

All student responses are automatically saved to a central media server and are accessible to the teacher.

To follow-up on student responses to an assigned exercise, the teacher clicks on the exercise token in the left panel.

As shown at right, the teacher can grade the assignment and provide feedback to students while reviewing the student response.
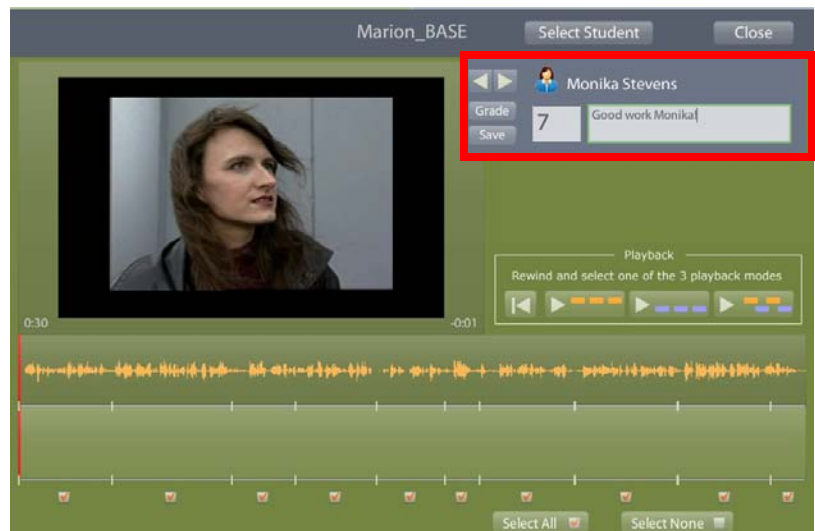
Media Player-Recorder

The Content Management module also includes the media player-recorder that students use to run media activities.

SmartClass + supports a broad range of different activities and can associate these activities with a number of different types of media file stimulus as summarized in the table below.

Media Activity	No Media File	Media File Stimulus			
		Audio	**Video**	**Image**	**Text**
Recording - Simultaneous		X	X		
Recording - Repeat-after-me		X	X		
Recording Open	X			X	X
Writing - Open	X	X	X	X	X
Writing - Open Question		X	X	X	X
Multiple-Choice Response		X	X	X	X
Writing – Captioning		X	X		

COMPARING CONTENT MANAGEMENT

Content management is the *Achilles' Heel* of most competitive systems, as they work entirely with media files at the student level. This requires that a teacher be present to provide detailed instructions about the intended activity, and so is highly restrictive for self-study work. Additionally, it takes a very tech-savvy teacher to be able to manage the requisite file transfers on-the-fly in front of a live class.

At best, competitive systems might provide a utility for captioning and/or bookmarking audio clips and video clips, but there is no real concept of building self-standing exercises. And none of the competitive products use a wizard approach to simplify this process for teachers. Instead, teachers must access a complex array of drop-down menus with an almost bewildering array of options.

The No Content Management Approach – aka "File Transfer"

Competitive language lab systems will actively promote their capability for file transfer between teacher and student stations. On the surface, file transfer seems like a good feature. Upon further analysis, however, the underlying issue is that the product does not include a centralized content management system.

Even the latest versions of our competitors' newest products rely heavily on file transfer to move media clips from the teacher to students and to collect responses from students.

In systems that do not support content management, when teachers want students to work with a particular media file, the teacher must first transfer this file to all students.   If students have completed a media activity, then the teacher must retrieve the student response file from each of the student stations. In effect, the already busy teacher becomes the content management system.

No Media Activities structure

None of the competitive systems include any utilities for organizing exercises into a multimedia course outline, as has been done with SmartClass +.

Teachers must manually choose which media files to make available to their students in each class, and must repeat this same activity year after year.

SUMMARY & CONCLUSIONS

For a language lab management system to be useful for teachers, it needs to:

- Be easy to learn and to operate
- Support the listening & speaking activities teachers want to run
- Provide a means for evaluating and giving feedback to students

Ease of Use

When we looked at system dashboards, we identified a number of factors that SmartClass + has adopted that contribute to teacher-friendly user interface:

- The overall look is modern and pleasing
- The key system features are presented without clutter
- Sophisticated activities are simplified using a step-by-step wizard-assisted approach
- Drop-down menus are eliminated to avoid an intimidating techie-feel

We noted that competitive offerings tend to use complex drop-down menus and clutter the screen with unnecessary controls (like media players and media recording controls) at all times. This makes learning and operating the system a challenge.

Sound Quality and Intercom Functionality

We noted that any software-based intercom implementation will exhibit some degree of delay and echo, and that the ability to listen to both microphone and computer audio is not supported when holding a 2-way conversation, or when monitoring a student who is recording.

Also, a software-based intercom can potentially interfere with the proper operation of 3rd party applications such as Skype or Tell-Me-More, or conversely, the 3rd party applications may impact the operation of the intercom.

SmartClass + offers a hardware-based intercom option to those clients who need excellent sound quality and complete functionality for supporting their students.

In an environment where the emphasis is on listening and speaking, the merits of a good intercom system that supports the functionality that teachers need are especially important.

Screen Sharing Quality

Software-based screen sharing implementations rely heavily on reducing screen data by using a lossy compression approach that degrades the screen refresh rate.   This is not an issue when the screen is mostly static, but increasingly becomes a problem when teachers and students are working with rich-media content like high-resolution graphics or motion video.

SmartClass + offers a hardware-based KVM option that ensures high-fidelity presentations of the teacher's screen and high-quality viewing of student screens under all conditions with no delay, a full color palette, full native resolution, and no degradation of the screen refresh rate.

Some clients may be prepared to sacrifice the quality of screen sharing, but for those who insist on the best, SmartClass + is the only solution that offers this hardware-based intercom option.

Content Management

SmartClass + has implemented a transparent content management solution that centralizes the storage of media exercises, student responses to those exercises, and feedback to students. Teachers and students have direct access to authorized materials without the need for file transfer without the need for knowing the details of where or how the materials are stored.

All competitive systems put the burden of content management on the teacher, and require that the teacher transfer files to students, collect files from students, and manage the Windows folders in which all of these files are stored.

From a teacher's perspective, the major issue here is the added complexity of having to manage the content themselves.   If the teachers are not tech-savvy, they will likely reduce the number of media activities they organize for their classes, or may not even run any media activities.

Content management is all about making the system easier to use, being supportive of activities that teachers need to run, and ensuring a simple means of providing feedback to students.

Flexibility and Upgradability

SmartClass + uniquely offers the flexibility of both software-based and hardware-based Intercom and KVM modules. The client may choose the options that work best for his particular enterprise in terms of performance, cost, and flexibility.

If the client wishes to change his options after-the-fact, there is no problem in upgrading any of the SmartClass + system modules at a later date.

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