Is technology a help or a hindrance in education in 2021? The global EdTech market size was valued at 89.49 billion USD in 2020, and is expected to reach 106.04 billion USD this year and yet, we still have issues of task duplication, frustrating educators nationwide.[1] The purpose of this research paper has evolved from how Google Classroom can interconnect with Skyward School Management System to eliminate task duplication, to interconnecting all K-12 technology onto one interconnected system.

There are several software programs used within K-12 Education. Education Software is a commonly used term that refers to any and all software designed for use within the education industry. The main types of software that are used within K-12 include student information systems (SIS), classroom management software or learning management software (LMS), enterprise resource planning (ERP), and student information systems (SIS).

A student information system can also be referred to as a student management system, school administration software, or a student administration system). It’s a management information system for all education establishments used to manage all of the students' data. This system provides the ability to register students in courses, track grading in all of the student’s classes, provide transcripts, display their involvement in extracurricular activities, and provide state assessment scores. It is also used to track student attendance and manage other student related information within the educational institution. The primary functions teachers utilize within an SIS is attendance and grading.

A learning management system is a software program for the administration and automation and delivery for all courses within the institution. It is the main platform for all online learning content, both asynchronous and synchronous based. “The main objective of the LMS is to host and track online learning. Providing a virtual hub where learners can access training resources, an LMS aims to make training accessible for remote learners and provide a central location for training across an institution or organization. Additionally, they make learning more streamlined, organized, and cost-effective. An LMS allows you to manage content, record and measure learning, store learner data, and communicate with (and enable communication amongst) users.”[7] Students are able to log on and see all of their course content, and turn the assignments into the same place. Teachers can create structured course content, and add text, images, videos, pdf’s, tables, links, customized tests and quizzes, slideshows, and more.

Enterprise Resource Planning software manages all of the business processes for a company, organization, and school districts. It is designed to manage all administrative tasks required for a school district. It is a central dashboard where all involved with the school district, teachers, administrators, parents, district employees can access important information at any time. For parents, they can use the ERP to register their child with the school district, upload confidential information required(such as birth certificate, shot records, health information, insurance, address, etc) and keep track of their child’s performance by accessing report cards. Teacher’s use this to access Human Resources, paycheck stubs and salary information, request time off, request substitutes, access benefits and so on. Administration uses this software to track the financial accounting of the school district, budgeting, cost management, order processing, etc. An ERP is a massive integrated system that shares a common database for all of the information and data necessary to run the school district.

These tools play an integral role in effectively running a school district, but why don’t they talk to each other? Each of these software applications are separate, and they require separate login credentials for each application. The problem is that due to the sales driven initiative within EdTech, this is creating more of a hindrance within educational institutions, instead of efficiency. At Lake Worth Independent School District, in Lake Worth, Texas, USA, they use Google Classroom as their LMS, Skyward Management System as their SIS, and Skyward Business as their ERP, all of which are separate applications.

The inspiration for this research project started with teachers at Lake Worth High School. They have to grade assignments within Google Classroom, and manually transfer them to the Skyward SIS gradebook. The school district did not have a way to integrate the two different software applications to work together, therefore duplicating tasks that teachers can ill afford.

As I began my research, I discovered that Skyward announced a partnership with Google as a part of Google’s Education Build Partner initiative. Through this partnership, “Skyward enabled educators to conduct real-time grade syncs from Google Classroom to Skyward’s Gradebook solution”.**[2]** Once the beta program was completed in March of 2020, Skyward launched a full functioning Application Programming Interface (often referred to as an API), which functions as a software intermediary that allows two completely separate applications to communicate with each other. Their goal of collaborating with Google is similar to the goal of this research paper, to reduce task duplication and double grade entries, relieving teachers in the process. “The integration between Skyward and Google Classroom will also eliminate the need for double grade entries, reduce the number of tools teachers need to master, and lessen the possibility for error in grade entries. Our collaboration with Google for Education is about saving time for teachers, so they focus on what matters most -- students. By providing one place to enter data, teachers can be more confident in their data while continuing to use the tools that work best for their needs.”**[2]**

This was a monumental moment for application integration and using technology to help with efficiency within education, but at what cost? I reached out to the Director of Technology for Lake Worth Independent School District, Gary Kuykendal, to see if teachers had access to this capability. The LMS API is an additional cost that the district has decided not to purchase at this time. But the district will be looking into this addition for the 2021-2022 school year. The school district already pays Skyward to use their system on a subscription basis, but isn’t included in the current package Lake Worth ISD is subscribed to. “Under this pricing model, the system is accessed over the internet, as opposed to installed on-premises. The payment is made either on a per user basis or a subscription basis. Ideally, customers are required to pay a recurring monthly fee until a specific period for using the tool.”[3] Skyward does not publicly publish their pricing models for school districts. In order to view their pricing, one has four options to choose from on their website. The inquirer can choose to schedule a live demo, speak to a sales representative, request a video of a live demo, or lastly, request private/charter school pricing.[4]

Skyward charges each school district differently, which is why there is no set price to use their software applications. According to skyward.com/moneytree, they provide an estimate of the savings a school district could receive when the user enters in the amount of students and faculty within the school district, but conveniently leaves out the actual cost of the service. Once the numbers are calculated and displayed, the site displays the amount that can be saved based on the information provided, and how certain features are individually calculated.

According to Lake Worth ISD, they service over 3500 students and over 500 faculty.[5] I put those numbers into the calculator provided, and the estimate Skyward gave was based on the input provided, was an estimated worth of $67,629.70 USD of savings per year. It also provided individual features and how they would be priced. Those features included Online W-2 (priced at $2.25 per employee, total of $1,158.75), Online Assignments(priced at $.59 per student, total of $2,094.50, Paperless Paychecks (priced at $3.75 per student, total of $1,931.25) Online Report Cards (priced at $1.94 per student, total of $6,887) Online Time Off(priced at $12.50 per employee, total of $6,437), Online Requisitions (priced at $6.85 per employee, total of $3,527.75) Online Registration(priced at $1.03 per student, total of $3,656.50) Purchasing Cards (priced at $61.43 per employee, total of $31,636.45) and AP ACH(priced at $20 per employee, total of $10,000).[6]

The features listed above are basic essentials, (these are just a select few) to run a school district. This does not come close to the total cost for school districts such as Lake Worth ISD and many others paying for Skywards services. This is just for the SIS, this does not include other LMS’s that are used, or Skyward Business (ERP). Efficiency comes at a cost, but how much is too much? Application integration should not be seen as an added bonus when dissecting the price structure of Skyward (and all of EdTech and it’s associated companies) when considering less affluent or more rural school districts in the state of Texas, equity is harder to come by. Bridging the technological gap and workplace efficiency should not come easy to some districts and unobtainable for others. If one pays for the service, efficiency should come with the cost. Skyward helped achieve this task by partnering with Google, and has an obligation to make it available to all who subscribe to those services.

The LMS that Lake Worth utilizes is Google Classroom and is currently free for all school districts. “Google Classroom is your all-in-one place for teaching and learning. Our easy to use and secure tool helps educators manage, measure, and enrich learning experiences.”[8] Through Google Classroom, teachers can keep their paperwork for all of their classes organized on a single dashboard, share content with their fellow teachers and their students, and facilitate discussions with their classes. Google offers Google Workspace for Education Fundamentals, which includes collaboration tools including google classroom, docs, sheets, slides, and forms, and everything included in the traditional google drive suite. It provides access to their communication channels such as google meet, gmail, and chat, and a data loss prevention for gmail and google drive.[9] Google classroom meets all the needs required of an efficient LMS. Google has made itself available to various different API’s from several different third parties to enhance the LMS environment. “Schools and technology companies can use the Classroom API to build tools that interact with Classroom and Google Workspace for Education, and make Classroom work better for their needs. The Classroom API is a Google Developer API. This means that non-google services can benefit from Google’s tools and infrastructure.”[10]

Google has led the charge of data and application integration, and has set the standard for this concept in education technology. So what is the hold up? Why haven't more companies taken hold of Google’s strategies for efficient accessibility for all? The student information system grade export feature (which eliminates task duplication) is only available for two partners, Infinite Campus users with the Campus Learning License, and Skyward version 2.0 users with the LMS API license.[10] However, currently, there are three other SIS applications that are in the process of participating in the SIS integration pilot, Capita SIMS, Aspen Follett, and Aeries.”[11]

Application integration is starting to become more of a standard within different SIS’s, making it more efficient for educators to perform daily tasks. Google has over 342 integrated apps within its own API Library. Additionally, Google allows any third party to utilize the Classroom API to integrate their data as long as their terms of service are agreed upon. Specifically, non-Google applications can use the Classroom API to integrate features of their application into the Classroom UI. “Hundreds of education applications work with Google Classroom. These integrations save teachers and students time, and make it seamless to share information between Classroom and their favorite apps.”[12] Some of those apps include BrainPOP, Buncee, EdPuzzle, PBS LearningMedia, Soundtrap, and many others. Different categories of those integrated apps include: Coding & Computer Science, Creativity Tools, Digital literacy, Instructional tools, Language, arts, & culture, Schoolwide tools, and STEM. These applications require purchase through the district, but connecting the two software applications is free of charge, and only requires an SSO(single sign on) through the student and faculties log-in credentials through the school district.

The ERP Lake Worth ISD uses is Skyward Business. This application has many features that handle the business affairs of the school district. Teachers mainly use this application for human resource needs, such as paid time off, substitution tracking, payment information, benefit access, etc. The sign in credentials to access Skyward Business is completely separate from the Skyward Student information system, and the two applications do not communicate at all. This is inefficient and fundamental integration principles that should be adopted, considering it is provided by the same company. Although the primary use for the ERP on a school district level is mainly utilized by district office employees and administration, teachers still require access to their personal and sensitive information, and this should also integrate at the very least with other Skyward applications, rather than requiring separate sign in credentials and requirements, and even separate support terminals.

With all of these API’s being developed, and more systems are starting to integrate and communicate with one another, what are the remaining issues? Two of the primary issues left to address is that these core applications are still separated from one another. LMS, SIS, and ERP applications are completely separate entities that don’t have a reason to not be all encompassed into one single application, rather than continually using different API licenses, further increasing the costs of operation. At the very least, two of these three main applications should be all encompassed. The other issue to be addressed is too much API integration, whose mission was to achieve efficiency and simplicity, can turn into over-complication and inefficiency.

Skyward (among other EdTech companies listed throughout this paper) has the capability to combine these technologies together to truly accomplish their mission of advancing educational technology, but those steps have not been taken, and perhaps are being avoided completely. Skyward developed a data automation tool called SkyBuild. “SkyBuild is the tool that can move data between Skyward and other systems”[13]. There are two main operations to utilize SkyBuild. The first way is “to take data that is currently being stored and tracked in Skyward, and put it into a data file so that it can then be loaded into another piece of software. Common examples of this are exporting data from Skyward into a Transportation, Library, or Food Service 3rd party program. The other way to use SkyBuild is to take data from a file; often times created from another system, the load that data into Skyward.”[13] This avenue definitely helps with efficiency, task duplication and reducing data entry time and is a step in the right direction, but still doesn’t address why Skyward’s SIS and ERP systems don’t communicate with one another, or why the two systems haven’t been integrated into one, whether it be SIS and ERP, or LMS and SIS. There hasn’t been any hint of doing so in the future.

Skyward has developed a new interface for their SIS and ERP systems called Qmlativ. “Qmlativ Education Management System, the next evolution of Skyward technology, is the epitome of a better SIS and ERP experience. Built to leverage the latest technology, it’s more than just a promise of features and functionality.”[14] It goes on to describe the updated platform as SQL-based with the major additions revolving around the user interface and support measures.

In a side by side comparison of Skyward’s SMS 2.0 and Qmlativ, the changes are as follows:

| **Function** | **SMS 2.0** | **Qmlativ** |
| --- | --- | --- |
| Search | Student Locator in Educator Access Plus only pulled up the student when searched for, and not the student’s entire profile. | When searching for a student, Qmlativ has a global search tool that allows you to pull up any piece of information on the student that is located in the system, claiming to be a major time saver. |
| Find Current Enrollment Numbers | The information is available, but takes multiple steps to get there. | Enrollment information is updated live and all data is up to date. There is a specific tab dedicated to this information, eliminating the multiple steps, bringing it down to one click. |
| Process Payroll | Requires payroll specialist to be accustomed to navigating the PaC and Web Solutions applications, as both are required to complete payroll processing. | Payroll tools are integrated into the same system. |
| Produce Reports | Reports are embedded into relevant areas of the software, but require additional steps to view the data in a presentable format. | Added a new built-in report writer feature and made it easier to share reports. Also added live tiles and updates. |
| Get Help | The primary way to get help is through SkyDoc, a repository for the written documentation and previously recorded webinars that were created with FAQ’s. Navigation is over complicated. | Added the Help Center, replacing SkyDoc, making sure all information obtained within the library is up to date and relevant. |

[14]

These updated features are great functional and sustainable upgrades that are needed. Yet, it still fails to address the issue of application integration and combining existing software. These upgrades are UI (user interface) focused, rather than integration focused. Skyward will not address this issue until it is financially feasible to do so. The profit coming in from them being separate software applications is too much to sacrifice for efficiency and a user-friendly work environment for students, administration and teachers.

The state of Texas made Skyward the state-sponsored system, claiming Skyward's response to advocate for increased productivity and low cost as their primary reason for doing so. “Skywards School Management System enables districts to realize significant cost savings and increase productivity. Through the state agreement with Skyward, Texas districts will have access to reduced pricing, disaster recovery services, and five year pricing guarantee, among other benefits.”[15] 9 of the top 20 largest school districts in Texas utilize Skyward due to this partnership. There are a lot of benefits that were listed, but yet, application integration advancement has stalled.

The alternative is an SSO (Single sign on) solution, which initially is a great solution, but when that becomes the only way the technology is integrated, it becomes confusing and complicated. In Lake Worth ISD, they use ClassLink. ClassLink delivers instant access to all web resources from connected devices. It also allows the user to launch remote applications in the current browser without installing any software to do so. Through this application, students and faculty have access to Google Classroom, and all external applications connected to Google Classroom. For students, in order to access Google classroom, they must go to lwisd.org, click on the menu, click on the students and families tab, click on the ClassLink link under the directory, sign in, and from there it directs the student to a main dashboard, enabling access into the third party applications, such as Google Classroom and the district’s gmail server, and virtual textbooks. That is a long drawn out process just to access the district's LMS system. For faculty, they can directly go to Google Classroom, avoiding ClassLink.

The English department of Lake Worth High School utilized an application called StudySync, an online educational curriculum tool for English language arts, ELL, social studies and science within K-12. It uses integrated technology with the virtual textbook to help engage their students. It provides integrated reading and writing, embeds skills lessons with assignments, tests, and different forms of media to help engage the students and teachers. When teachers would assign assignments from the StudySync application, the grade could not integrate from StudySync into Google Classroom. So the teacher has to manually go in and view if the assignment, test, or quiz, was completed. The link can be accessed inside of Google Classroom, but what happens in StudySync stays in that application. The student has to manually enter that the assignment was completed in Google Classroom, as does the teacher.

Another issue regarding this is having multiple different applications integrating into several different systems. On top of the district gmail account that all students and faculty have because of Google Classroom being utilized as the LMS, the school district also uses Microsoft Outlook as the primary form of communication between teachers, faculty, staff, and parents. There isn’t any SSO associated with this application, or API that integrates this feature in Skyward or Google Classroom. It has to be accessed separately, with different login credentials.

Too many applications to utilize the SSO feature can overcomplicate the technology, making it burdensome for all involved. The initial purpose of using these technologies was to promote efficiency and user-friendly features, but in turn has done the exact opposite.

So what is the solution? As of right now, a fully integrated system does not exist, but there are developing applications going in that direction. Moodle is the closest application that is actively working towards this process. “Moodle is a learning platform designed to provide educators, administrators and learners with a single robust, secure and integrated system to create personalised learning environments.”[16] Part of Moodle’s mission is to be ever evolving, giving everyone access to this application, free of charge, and open sourced. “Moodle is provided freely as Open Source software, under the GNU General Public License. Anyone can adapt, extend or modify Moodle for both commercial and non-commercial projects without any licensing fees and benefit from the cost-efficiencies, flexibility and other advantages of using Moodle.”[17]

Moodle wants to fix these issues within EdTech, and understand that by making it open source, anyone can enhance the code and develop additional tools and functionalities to constantly improve it and to customize it to any organizations specific needs. It enables and encourages collaboration and constant new development of technology within education, rather than making a profit off of tax-payer funded establishments.

In conclusion, there have been many technological advancements within all education systems across the world. Most platforms are seeing the need for application integration between third party sources and primary sources, but are applying the band-aid of API’s and SSO’s as the solution. After extensive research, there are two solutions that could help aid this problem and move EdTech forward. First, the main applications, SIS, LMS, and ERP need to be connected to each other. There are two ways this can be accomplished reasonably. I believe that the combination of the LMS and SIS applications is the most logical route to pursue regarding this issue. They both share integral data (such as student profiles and all of its associated information, background, test assessments, transcripts, gradebook data, course curriculum, and so on)that is required to run, and all assignments can be in the same place, and the gradebook can automatically be integrated with the associated course and assignments with it being on the same platform. The second solution is to combine the SIS and ERP applications, especially since in this particular case study, they are developed by the same company, Skyward. Combining these applications will help with human-computer interaction, and bring about user-friendly enhancements that will improve every single user within the district. Teachers need technology to make their working lives more efficient, not more complicated. Combining these applications will achieve data automation for all staff, parents and students. All information (grades, test scores, student profiles, confidential information, district tables and analysis, course registry, financial information, district registry, human resources, etc) can be accessible in one single application. By implementing one of these suggestions, that will help the advancement of educational technology and enhance the efficiency it is striving for.

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Glossary

| Term | Definition |
| --- | --- |
| API (Application Programming Interface) | A set of functions and procedures allowing the creation of applications that access the features or data of an operating system, application, or other service. |
| API Library | An API is a term meaning the functions/methods in a library that you can call to ask it to do things for you - the interface to the library. |
| Application Integration | Application integration enables applications and systems that were built separately to work together, resulting in new capabilities and efficiencies that cut costs and uncover insights. |
| ClassLink | ClassLink provinces OnClick single sign-on into web and Windows applications, and instant access to files at school and in the cloud. |
| Classroom API | It is a Google developer API. Using this, you can do programmatically many of the things teachers and students can do through the Classroom UI. |
| Duplicate data entry | Data entry that has to be entered in more than once. |
| ERP | Enterprise Resource Planning (ERP) consists of technologies and systems companies use to manage and integrate their core business processes. |
| EdTech | A combination of “education” and “technology” refers to hardware and software designed to enhance teacher-led learning in classrooms and improve students’ education outcomes. |
| Efficiency | Especially of a system or machine, to achieve maximum productivity with minimum wasted effort or expense. |
| Education Software | The developmental and non-developmental software which are specifically used for education. |
| Google Classroom | A free web service developed by Google for schools that aims to simplify creating, distributing, and grading assignments. |
| Google Workspace | Building on G Suite, it is a separate paid plan that provides a custom email for businesses and includes collaboration tools. |
| GNU | GNU is an operating system that is a free software that consists of GNU packages as well as free software released from third parties. |
| Grade Export Feature | A SIS grade export feature that connects Google Classroom with third party SIS systems. |
| Human-Computer interaction | A field based in the design and the use of computer technology, which focuses on the interfaces between users (humans), and computers. |
| LMS API | An API created by Skyward that connects to Google Classroom. |
| LMS | Learning Management System is a software application for the administration, documentation, tracking, reporting, automation and delivery of educational courses, training programs, and learning and development programs. |
| Moodle | Moodle is a learning platform of course management system - a free open source software package. |
| Qmlativ | The latest evolution of Skyward’s Education Management System, the next version after SMS 2.0. |
| SIS | A management information system for education establishments used to manage student data. |
| SkyBuild | A tool developed by Skyward that can move data between Skyward and other systems. |
| Skyward | A K-12 Software Company. |
| SMS 2.0 | A version of Skyward’s SIS. |
| SSO | Single Sign On, which enables the user to sign on once into multiple applications. |
| StudySync | An educational publisher that develops products using designs and technology to engage educators and students. |
| SQL-Based | Structured Query Language is a domain-specific language used in programming and designed for managing data held in databases. |
| Task Duplication | The same tasks that have to be done multiple different times. |
| UI (User Interface) | Interfaces in software that focuses on looks and style for the user. |