

# A Web-based Lesson Plan Creator for Teaching Preparation Programs

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**Abstract:** This paper presents our ongoing work for designing and implementing a web-based Lesson Plan Creator for pre-service credential candidates in special education programs. To help reduce the workload of credential candidates as well as improve their professional teaching skills, we have designed a lesson plan creator system with the idea of shortening the amount of time required for creating sound and evidence-based lesson plans. This web-based application utilizes the model-view-controller (MVC) model as its design pattern and applies advanced JavaServer Pages (JSP) technologies for system developing. Furthermore, this paper offers our usability test result, as well as our future plans for further development of this evolving system.

## Introduction:

Improving educational outcomes for all students is the overarching goal of two pieces of recent legislation in the United States (U.S.). The Individuals with Disabilities Education Act of 2004 (IDEA 2004) outlines regulations to ensure all students, especially students with learning differences, gain access to evidence-based instructional strategies so they may benefit from a more stimulating general education curriculum. The No Child Left Behind Act (NCLB) requires that all teachers be highly qualified in content areas and all students be included in annual assessments of student outcomes (No Child Left Behind Act Pub.L.No.107-110, 2002). In response to these stringent new requirements, educational leaders are seeking innovative solutions to improve teacher preparation programs, especially addressing areas of severe shortage like special education, math, and science. We suggest that innovative technological tools can strengthen the infrastructure of teacher preparation programs and improve the quality of teachers entering the field.

Due to the dramatic shortage of special education teachers, new teachers often enter the classroom at the same time they begin their teacher preparation program. Kauffman et al. (2002) report new teachers are receiving little or no guidance about what to teach and how to teach it (Kazunori et al., 2009). The cornerstone of special education for those students receiving services is the Individualized Education Plan (IEP), and every student must have a plan written specifically to meet his or her individualized needs. In turn, new teachers must create lesson plans that include objectives aligned with IEP goals and state content area standards. Additionally, instructional strategies to address lesson plan objectives must be evidence-based, meaning they are promising or proven effective strategies. However, finding and implementing empirically sound instructional strategies and interventions is a tall order for those who enter the field with little or no pedagogical training and less content knowledge in challenging areas such as science and math than their general education peers (Boe, Shin, Cook, 2007). They face the immense challenges of learning and teaching new content areas, and identifying appropriate strategies to address their

students' various learning challenges. Adding to the stress, the first year teachers are overwhelmed with university work in addition to designing classroom activities.

In order to help these teachers reduce their workload, we decided to take the advantage of current technologies to build a tool that can provide essential functions and necessary supports in teaching preparation. By collaborating with the Special Education Department, we were able to ask teacher candidates in the Mild/Moderate Credential Program to express their requirements and needs during the system design process. After interviewing the users and analyzing users' feedback, we ensure that the technological tool can assist teachers in becoming immediately effective in the classroom by providing support in writing adequate and evidence-based lesson plans.

This paper describes our work on designing and implementing a Web-based Lesson Plan Creator. First, we move a current paper-based lesson plan template into digital format for efficient management with all of the collected digital data stored in a relational database. Second, we enable this tool to link IEP goals with specific grade-level content standards and allow users to issue a specialized search of California Content Standard (CACS) database to quickly locate appropriate standards at chosen grade levels. We accomplish this task by building a MySQL database at server end and using structural tables to store the CACS. Third, we provide a useful list of educational database in a web page managed by university librarians and updated periodically. The system uses key words from chosen content standards as descriptors to initiate a search of educational databases. In this way, our system assists candidates in meeting the federal requirement of locating and implementing evidence-based instruction that often takes teachers hours to find. Therefore, teacher candidates can more efficiently perform an in-depth search for instructional strategies and interventions without hesitation.

The approach for designing and developing a web-based lesson plan creator can bring several benefits to users. First, this technological design may benefit all teacher preparation programs, moving beyond the specific goal of special education teacher preparation. For instance, the developing tool could be helpful in preparing general pre-service teacher candidates for mathematics and science. A convergent body of research (Cobb, Yackel, McClain, 2002; Heibert, Grouws, 2007; Hill et al., 2008, p 430-511; Rose, Meyer, 2006) suggests pre-service teachers need explicit guidance in how to achieve conceptual engagement and counteract the tendency to focus only on specific contents and/or procedures. Second, the tool directs teacher candidates to proven and promising research-based instructional strategies and curriculum designs that they can utilize in their classroom or professional practice. In this way, new teachers can avoid fads, ineffective practices, and personal biases in choosing instructional strategies. Third, this system encourages teacher candidates to become informed consumers of educational research. By generating cumulative knowledge of effective practices, these new teachers will contribute to the field's capacity. Lesson Plan Creator immerses pre-service teachers in educational research and enables them to continually move between research and practice (Kazunori et al., 2009).

This paper starts with system requirements and web page design. Later on we discuss the system architecture and show our usability test result. Finally, we conclude this paper by discussing our contributions and the planned future work of our ongoing study.

## **System Requirements**

One key point of implementing this web-based application is to study carefully the specifications and requirements since its domain is very specific to issues in typical special and general education programs. Credential candidates are our target users, and also students of credential programs who teach K to 12 grade students with mild or moderate learning disabilities. Our target users have experimented with an existing commercial software, "LiveText" (Live Text, 2009), which provides a web based platform for users to create e-portfolio, manage lesson plans, and search state content standards. Although this software provides a comprehensive platform for users to create a lesson plan, it is costly, inefficient, and difficult to change. For example, users are left to design a layout for their lesson plan before they can input lesson plan information. Moreover, all of the data created in "LiveText" is treated as propriety and cannot be shared with the general public. Our candidates have limited computer background and even less time to spend learning how to use complicated software. Thus, developing our own system that enables teachers to save time and money, and increase efficacy in the classroom provides the basic motivation of our work. When creating a lesson plan, a couple of questions need to be taken into consideration: a) What kind of content standards should be used? b) How can teachers find the appropriate standards? and c) How can we ensure a lesson plan is evidence-based? In the development of our system, we answer all three of these questions. First, the user can search all state content standards by using the standard search function. Second, we store all California content standards in our own database making retrieval fast and easy. Third, upon aligning the IEP goals with lesson plan objectives and appropriate content standards, the user can initiate a search for peer-reviewed journal articles

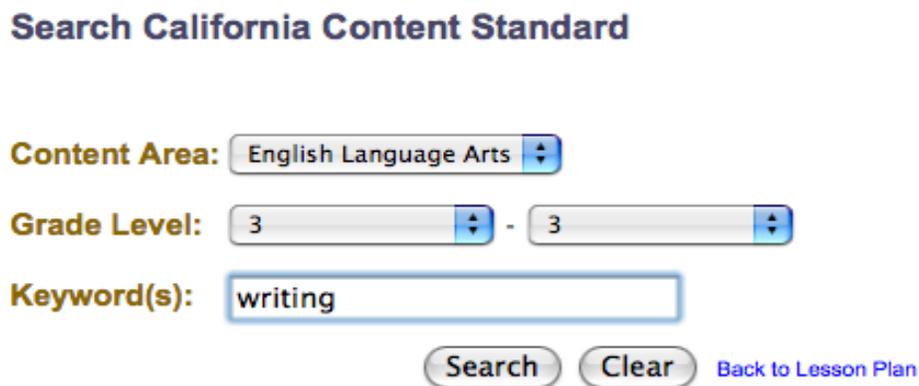
from which they retrieve promising and proven strategies for teaching the lesson. We will discuss more detail further on.

First, we move the current paper-based lesson plan template to a digital form, which can save the user physical space and shorten the data entering time. The Lesson Plan Template guides the user in the creation of an evidence-based lesson plan that meets the stringent new requirements for implementing sound instruction in the classroom. The template enables the user to create, modify, delete, view lesson plan template items, and then print the lesson plan or save in the template form. Second, our system provides an interface for credential candidates to search CACS, select appropriate standards from the result list, and add them into their lesson plan. Credential candidates can efficiently find CACS by inputting content areas, grade levels and appropriate keywords into our search engine. Third, the system provides a list of educational databases that is most useful for teachers. User can click any of the database links to search for peer-reviewed articles, and then add the article information into their lesson plans for future reference. We are currently collaborating with various departments to gain access to multiple digital databases and return the search result to our users.

## System Design and Architecture

During the user interface phase, there are two main aspects of the system that are taken into account. First, the front-end interface is required to follow our institutional university web-site template. Second, we design an easy-to-use web application. Our main users, credential candidates, are graduate students who are simultaneously teaching full-time. Their time constraints and limited computer background must be considered. Therefore, having a user-friendly and well-guided interface is very important. In addition, when creating lesson plans that align content standards with objectives and goals to initiate a search of peer-reviewed journal articles, it is more important to construct an intuitive and simple interface than an overly attractive one, rich in superfluous features.

One of the core features of our Lesson Plan Creator is its flexibility to find appropriate CACS and add them into a lesson plan. There are nine general content areas in California and each of them has hundreds of content standards; finding an appropriate standard is a tedious and time-consuming task. Candidates can search for the most appropriate content standard by entering pertinent information from other fields. For example, a user can choose English Language Art, grade 3, and writing, to locate the related content standards (refer to Fig. 1).



**Search California Content Standard**

**Content Area:** English Language Arts

**Grade Level:** 3 - 3

**Keyword(s):** writing

Search Clear [Back to Lesson Plan](#)

**Figure 1:** User Interface for CACS Search Page

All satisfied results will be returned in a table format ordered by original content standard ID in order to increase readability with all input keywords highlighted (refer to Fig. 2). In this way, our system quickly narrows down the search scope for the user and easily adds the content standards they requested by selecting content standard ID. This capability enables the user to create the lesson plan efficiently.

## CACS Search Result List

[Add](#)

StandardSets	Description
<input type="checkbox"/> CA.ENG.3.WO.1.1	Understand and be able to use complete and correct declarative, interrogative, imperative, and exclamatory sentences in <b>writing</b> and speaking.
<input type="checkbox"/> CA.ENG.3.WO.1.2	Identify subjects and verbs that are in agreement and identify and use pronouns, adjectives, compound words, and articles correctly in <b>writing</b> and speaking.
<input type="checkbox"/> CA.ENG.3.WO.1.3	Identify and use past, present, and future verb tenses properly in <b>writing</b> and speaking.

[Back to Lesson Plan](#)      [Previous](#) 1 [Next](#)

**Figure 2:** User Interface for CACS Result List

The other feature we provide is article search function that helps users to search for peer-reviewed journal articles through the university library (refer to Fig. 3). The article search page is divided into three parts. First, we display the CACS that have been previously selected by the users for references. Then, we provide a list of article databases related to special education. Users can choose one of them and search for an article. The last part of the page allows users to add the information of articles as further references. By using such function, users do not need to hesitate about where to find an article and can more effectively search appropriate articles.

### Article Search

CACS  
The content standard(s) you just found.

Standard Set	Description
CA.ENG.11-12.WS.1.0	Students write coherent and focused texts that convey a well-defined perspective and tightly reasoned argument. The writing demonstrates students

### Find Articles and Databases

**Education (14)**  
Subject Librarian - [Athena Nazario](#)

#### Most Useful

- Google Scholar** ⓘ  
Provides a simple way to do a broad search for scholarly literature, including peer-reviewed theses, books, abstracts and articles....
- ProQuest Education Journals** ⓘ  
Offers access to over 745 top educational publications, including nearly 600 of the titles in full
- Education Research Complete** ⓘ  
Topics covered include all levels of education from early childhood to higher education, and a wide range of educational specialties, such as multilingual education, health education, and testing. ...

Article(s) you found:

Title	Link

[Add Article](#)

[Back to Create Lesson Plan Page One](#)

**Figure 3:** User Interface Article Search

This web-based application employs three-tier client-server architecture per the J2EE specification that is widely used. The tiers are separated functionally into user interface, business logic and data access. The user interface tier represents the components that display data and tasks available to the user, as well as handling input. The business logic tier represents application components that make computational and procedural decisions based on calls from the user interface. The data access layer represents parts of the application that organizes, stores, and

retrieves data, sometimes from multiple data sources. This approach allows us to write reusable and flexible programming code that can be easily extended for new features (Weaver et al., 2003).

## Usability Test and Result

In designing and implementing any application, user satisfaction is the most significant metric in measuring success of the product. Applications should undergo user evaluation to test its usability. No matter how careful the designers are and how many of the requirements designers have collected to create the site, they must always obtain new ideas from the user evaluation. According to Eccher et al. (2004), users usually spend only 10-20 seconds on the homepage trying to learn about the site. Communication with users through the information shown on each page has to be considered carefully. Therefore, to evaluate the usability of our web tool, we conducted a usability test from July 8 to July 15, 2009.

We randomly selected 11 volunteers from Mild/Moderate credential program to perform the test by answering two questionnaires after completing the given tasks. One questionnaire is related to the lesson plan creator part, while the other one is related to the E-portfolio manager. There are five scales for each question: Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A), and Strongly Agree (SA). The test is an anonymous self-administrated test that could be done anywhere, at any convenient location, using any available computer.

The statistics data (refer to Tab. 1) for lesson plan creator show that 7 out of 11 answers are positive and 4 questions have negative response. By studying comments from testers, we can divide the disagreements into three parts: 1) Though the typeface of character is neat, the font size is too small to view clearly. Currently we are using size 12, but testers prefer a larger size. 2) There are few user instructions in our site, which sometimes confuses tester. An additional user guide will make the site more user-friendly. 3) There is a compatibility issue for printing. Since we only support Microsoft Word document format, testers who use the Mac OS X operating system may have difficulty printing out their lesson plan. We are currently addressing this issue.

Attitude	Questions (#SD, #D, #N, #A, #SA)
Positive	1. It is easy to figure out where and how to input the data. (0, 0, 0, 6, 3) 2. You find the lesson plan template covers enough information you expected. (0, 0, 1, 4, 4) 3. You find the lesson plan template format is simple and useful. (0, 0, 0, 5, 4) 4. It is easy to find CACS search page. (0, 0, 1, 4, 4) 5. It is easy to locate CACS by using search function. (0, 0, 0, 5, 4) 8. It is easy to find article search page. (0, 0, 1, 4, 4) 11. It is easy to view/modify/delete a lesson plan. (0, 0, 0, 4, 5)
Negative	6. The layout of CACS result list is clear and well organized. (0, 1, 0, 6, 2) 7. It is easy to figure out how to add CACS to lesson plan template. (0, 1, 1, 5, 2) 9. It is easy to figure out how to add article references to lesson plan template. (1, 2, 4, 1, 1) 10. It is easy to print out lesson plan. (0, 1, 1, 3, 4)

**Table 4:** Usability Test Results

## Conclusions

As discussed above, our motivation to create this web-based lesson plan creator was to help special education teachers to prepare their lesson plans more easily and effectively. With teacher candidates as our clients, we spent approximately one third of our developing time communicating with them and collecting user information. After having all the information in hand, we began to analyze the user requirements and change the conceptual idea into a physical prototype. Based on the prototype, we implemented a user interface system and evaluated it with a usability test. The preliminary result of the usability test reported in this thesis confirms that our design meets the user requirement sufficiently. Our system has two prominent features: it is intuitive to use and it provides evidence-based instructional strategies and interventions. By intuitive, we mean the user can navigate the web page and use the functions without difficulties. Compared to existing similar software, our users only spend five to ten minutes figuring out how to type data into the lesson plan template and search for necessary information versus thirty minutes when using Live Text. By evidence-based, we mean our system provides a platform for users to search for

peer-reviewed journal articles. We provide an appropriate database list and the user can connect to the database through our system. Last but not least, while we have focused on our special education teachers, our system may be useful for many other teacher preparation programs. This paper argues the system's advantages for facilitating effective, efficient training of teacher candidates in a university teacher preparation program and those candidates who complete the program but wish to continue using the Lesson Plan Creator.

Currently this is the first version of the lesson plan creator. Although we have most of the basic functions in the system, there is still much room for improvement. One of the many exciting ideas for our future investigation is to expand our printable file format, which currently only outputs Microsoft Word documents. In the future we may support more file formats, such as Open Office, Adobe Acrobat, etc... to make the system more compatible. Another interesting idea for exploration is to make current lesson plans intelligent. So far we can only provide users with an educational database list and they must extract the teaching strategies by themselves. To enhance the application in the future, we are now collecting relevant and important articles, from which graduate students under our guidance, manually extract proven and promising instructional strategies in their methodology sections. Such collected strategies and interventions can be organized in a database that can be incorporated into our lesson plan creator. With such a tool, teacher candidates will be taken one step closer to implementing research to practice by having easy access to the extracted promising strategies. In addition, we continually keep the field abreast of new promising and effective strategies for teaching.

Other future research ideas include: a) Covering more content areas and content standards than what we are currently supporting; 2) Deploying the complete system in additional teacher programs to examine its efficacy; and 3) Investigating how to adapt our system to different programmatic contexts in other countries and educational cultures.

## References

- Boe, E. E., Shin, S., and Cook, L. H. (2007). Does teacher preparation matter for beginning teachers in either special or general education? *The Journal of Special Education*, 41(3). 158-170.
- Cobb, P., Yackel, E., and McClain, K. (Eds.) (2002). *Communicating and symbolizing in mathematics: Perspectives on discourse, tools, and instructional design*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Eccher, C., Hunley, E. and Simmons, E. (2004). *Professional Web Design: Techniques and Templates*. Hingham, Massachusetts : Charles River Media, Inc., second edition.
- Heibert, J., and Grouws, D. A. (2007). The effects of classroom mathematics teaching on students' learning. In F. K. Lester (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 371-404). Greenwich: Information Age.
- Hill, H. C., Blunk, M. L., Charalambous, C. Y., Lewis, J. M., Phelps, G. C. Sleep, L., Ball, D. L.(2008). Mathematical knowledge for teaching and the mathematical quality of instruction: An exploratory study. *Cognition and Instruction*, 26(4), 430-511.
- Kauffman, D., Johnson, S. M., Kardos, S. M., Liu, E., and Peske, H. G. (2002). 'Lost at sea': New teachers' experiences with curriculum and assessment. *Teachers College Record*, 104(2), 273-300.
- Kazunori, O., Ngoc, L.M., Xinhang, S., and Susan, C. (2009). Web-based tools for enhancing teacher preparation programs - helping to build a high quality teaching workforce. In *CSEU 2009: Final Program and Book of Abstracts*, pages 69-70.
- Live Text. (2009). LiveText – Learning Assessment Accreditation Solutions [on line]. Available at: <https://www.livetext.com/>.
- No Child Left Behind Act of 2001, 20 U.S.C. 70 § 6301 et seq. (2002).
- Rose, D. H., and Meyer, A.(2006). *A practical reader in universal design for learning*. Cambridge, MA: Harvard Education Press.
- Weaver, J. L., Mukhar, K, Crume, J. P.,Phillips, R. (2003). *Beginning J2EE 1.4*. Birmingham: Wrox Press.

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