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A MECHANISM TO ENABLE CREATION OF PER-STUDENT WORKSHEET COPIES THROUGH INTEROPERATION BETWEEN LEARNING MANAGEMENT SYSTEM AND CLOUD-BASED CONTENT SOFTWARE TOOLS

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A Learning Managements System (LMS) is a software application that may enable educators to teach in an online setting. Using an LMS, educators may administer, track, report, automate, grade, and/or deliver educational material to their students. Students, in turn, may use the LMS to access educational material, complete assignments, and/or interact with their teachers and classmates.

Educators may also use third-party cloud-based content software tools (also referred to as third-party EdTech tools) to supplement their online course material. Third-party cloud-based content software tools may provide additional resources for a particular subject matter, including teaching videos, supplementary materials, and/or worksheets, for example. Educators may wish to take advantage of existing third-party cloud-based content software tools to enhance the learning experience for their students.

However, conventional learning management systems do not provide worksheet copy coordination through interoperation between the LMS and the third party EdTech tools. While EdTech tools may have the ability to create unique worksheet copies, the EdTech tools may not have the capability to create a correct number of copies or to grant an appropriate level of access permission for each worksheet, for example. Conventional technology may result in educators having to manually create a digital copy of worksheets provided by third-party cloud-based content software tools for each student, which may be an onerous process for educators.

Aspects of the present disclosure address the above and other deficiencies by proposing a mechanism to enable creation of per-student worksheet copies through interoperation between

LMS and cloud-based content software tools. Specifically, the proposed method enables educators to request the automatic creation of unique third-party EdTech worksheets for each student in their classes. The method described herein is not limited to a teacher/student environment, and may be applied to any instance in which individual digital copies of a third-party resource are requested.

The method described herein may enable educators to request a copy of an EdTech worksheet to be created for each student in their class. The LMS may display a list of EdTech tools that an educator may access and worksheets provided by the third-party EdTech tools. In creating a new assignment for a class, an educator may select a worksheet provided by one of the third-party EdTech tools listed in the LMS. The LMS and the third-party EdTech tools may communicate using an application programming interface (API). Once the educator has selected an EdTech worksheet to assign to the class, the method described herein may issue a request (e.g., a call) to the third-party EdTech tool that a copy of the worksheet be created for every student in the class. The request may be accompanied by the class roster, or alternatively, the EdTech tool may respond by requesting that the LMS fetch the class roster.

In one example, the EdTech tool may create a copy of the selected worksheet for each student in the class roster. The EdTech tool may then provide to the LMS a unique resource link for each student, which the LMS may use to distribute copies of the selected worksheet to the respective students.

Alternatively, the number of requests concurrently issued to an EdTech tool can be reduced to avoid overloading the EdTech tool. Specifically, the LMS may create a unique identifier in a pre-defined format. The unique identifier may identify the course, the assignment, the EdTech worksheet, and/or the request action (e.g., the request action may be to make a copy

for each student). The students may then be provided with a link to the EdTech worksheet, and upon clicking the link, the LMS may add the unique identifier. For example, the LMS may attach the unique identifier as a parameter in the URL. The EdTech tool may then intercept the URL parameter, create a unique copy of the worksheet for that student, store the unique copy of the worksheet at a particular location (e.g., temporarily) and redirect the student to that location to obtain the unique copy of the worksheet.

Figure 1 illustrates a flow diagram of a method for enabling creation of per-student worksheet copies through interoperation between LMS and cloud-based content software tools. The method may be executed by the LMS. The LMS may enable an educator to create a new assignment for a class. The assignment page may include an "add attachment" feature, for example, which may include a drop-down list of third-party EdTech tools that the educator may use. An educator may select one of the third-party EdTech tools from the drop-down list, which may then enable the educator to select a worksheet to add to the new assignment.

At block 102, the method may receive a request to create copies of a worksheet provided by a third-party EdTech tool for a class. For example, the educator may be presented, in a graphical user interface of the LMS, with a list of worksheets provided by a third-party cloud-based content software tool, and may select a specific worksheet from the list displayed on the graphical user interface of the LMS.

At block 104, the method may send a request to the third-party EdTech tool to create a copy of the selected worksheet for each student in the class. For example, the request may be in the form of a call issued via a predefined endpoint exposed by the third-party cloud-based content software tool. The LMS may send a class roster as part of the request. Alternatively, the

EdTech tool may respond (e.g., via a response call) by requesting the LMS to fetch the class roster.

At block 106, in response to receiving a response from the third-party EdTech tool, the method may determine whether the EdTech tool has created a copy of the worksheet for each student in the class. For example, the third-party EdTech tool may be overwhelmed by the number of requests it has received, and may respond to the LMS with an indication that the EdTech tool cannot handle the request at this time. Upon receiving such a response, the method may move to block 112. Alternatively, the third-party EdTech tool may indicate to the LMS that it can handle the request. For example, the third-party EdTech tool may respond to the LMS by sending a unique resource link for each worksheet copy created in response to the request sent by the LMS, and the method may move to block 108.

At block 108, the method may receive a unique resource link for each worksheet copy created by the third-party EdTech tool for each student in the class. That is, the EdTech tool may create a digital copy of the worksheet for each student in the roster. The EdTech tool may then respond to the LMS and provide the LMS with a unique resource link to a worksheet copy for each student.

At block 110, the method may provide the unique link to each respective student. For example, the LMS may include the unique resource link within each student's respective LMS assignment, and/or the LMS may send an email to each student including the student's unique resource link. When the student clicks on the unique resource link, the student may be automatically directed to his or her unique worksheet, which the student can then complete and submit to the educator.

Alternatively, if at block 106 the method has determined that the EdTech tool may not have created worksheet copies for each student, the method may move to block 112. At block 112, the method may create a unique identifier in a predefined format. For example, the unique identifier may identify the course, the assignment, the specific EdTech worksheet, and/or the request action (e.g., the request action may be to make a copy for each student).

At block 114, the method may provide the same resource link to each student in the class to access the assigned third-party EdTech worksheet. At block 116, in response to receiving a request from a student to access the worksheet, the method may add the unique identifier, along with a student identifier, to the request. For example, the student may request to access the worksheet by clicking the resource link, and the method may attach the unique identifier payload, along with a student identifier, as a parameter in the URL.

The third-party EdTech tool may intercept the URL parameter and may determine whether it has created a copy of the worksheet for that specific student. If it has, the EdTech tool may automatically redirect the student to the student's unique worksheet. If not, the EdTech tool may create a copy of the worksheet for that student and redirect the student to the newly created worksheet.

As an alternative example, the method may determine, before sending the worksheet creation request, whether the third-party EdTech tool can handle a high volume of requests. For example, the LMS may store a list of third-party EdTech tools that are not equipped to handle a large number of requests at one time. The method may determine whether the third-party EdTech tool from which the educator is requesting worksheet creation is on the list. If so, instead of sending the request to the third-party EdTech tool at block 104, the method may skip directly to block 112 and create a unique identifier for the worksheet assignment. The method

may then proceed to blocks 114 and 116 as described above. In this manner, the LMS can avoid overburdening certain EdTech tools by not sending large volumes of worksheet creation requests.

The method described above may also include login integration. For example, the third-party EdTech tool may require students to login with a unique username and password before accessing the EdTech tool. To simplify the login process, the LMS may include login integration between the third-party EdTech tool and the LMS. For example, the third-party EdTech tool may enable the LMS to login to the EdTech tool using each student's LMS credentials. As another example, the third-party EdTech tool and the LMS may be linked, allowing the LMS to create worksheets within each student's EdTech account using the student's LMS login credentials. As a result, students may not need to login to each third-party EdTech tool that the educator assigns. The students thus may need to remember a single username and password combination (i.e., to login to the LMS). Students may have the option, at any time, not to allow the LMS to login to their third-party cloud-based content software tool's accounts.

Abstract

A method for enabling creation of per-student worksheet copies through interoperation between learning management systems (LMS) and cloud-based content software tools is disclosed. The LMS may receive, from an educator, a request to create copies of a specific third-party cloud-based content software tool worksheet for a class. The LMS may send the request to the third-party software tool along with a class roster, which may create a unique digital copy of the worksheet for each student in the class. The LMS may then send, to each student, a unique resource link to the worksheet. The LMS may, alternatively, create a unique identifier identifying the course assignment and the worksheet. When a student requests access to the worksheet, the LMS may add the unique identifier to the request. The third-party software tool may then intercept the request, create a unique digital copy of the worksheet for the student, and redirect the student to the newly created unique worksheet.

Keywords: learning management system (LMS), cloud-based content software tools, third-party EdTech tools, worksheet creation, worksheet assignment, LMS integration, LMS interoperability
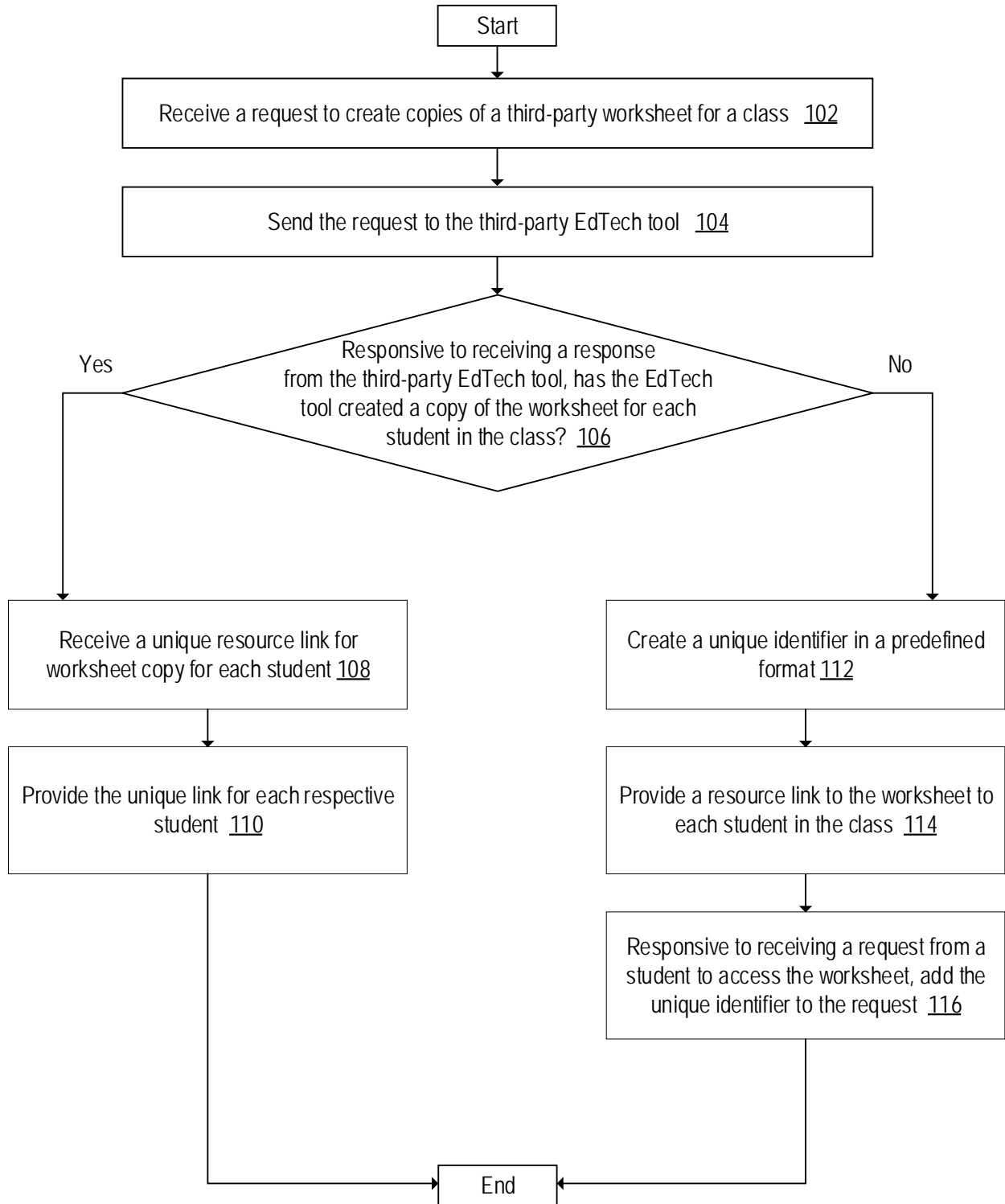
```
                              ┌──────────┐
                              │  Start   │
                              └────┬─────┘
                                   ▼
   ┌───────────────────────────────────────────────────────────────┐
   │ Receive a request to create copies of a third-party worksheet  │
   │ for a class   102                                              │
   └───────────────────────────────┬───────────────────────────────┘
                                    ▼
   ┌───────────────────────────────────────────────────────────────┐
   │ Send the request to the third-party EdTech tool   104          │
   └───────────────────────────────┬───────────────────────────────┘
                                    ▼
                          ╱◇◇◇◇◇◇◇◇◇◇◇◇╲
    Yes          Responsive to receiving a response          No
  ◄──────    from the third-party EdTech tool, has the EdTech    ──────►
             tool created a copy of the worksheet for each
                        student in the class?   106
```

Start

Receive a request to create copies of a third-party worksheet for a class   102

Send the request to the third-party EdTech tool   104

Responsive to receiving a response from the third-party EdTech tool, has the EdTech tool created a copy of the worksheet for each student in the class?   106

Yes

No

Receive a unique resource link for worksheet copy for each student 108

Create a unique identifier in a predefined format 112

Provide the unique link for each respective student   110

Provide a resource link to the worksheet to each student in the class   114

Responsive to receiving a request from a student to access the worksheet, add the unique identifier to the request   116

End

Figure 1