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Delivery of Personalized Educational Content

Abstract

Examples provided herein are directed to deploying personalized educational content to student devices. In example implementations, a computing system may communicate with student devices corresponding to students in a classroom setting. The computing system may cause the student devices to obtain educational content from content providers. As a student progresses through a lesson plan by interacting with a student device, the computing system may intelligently deploy educational content that is personalized to the student's academic abilities and needs.

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Claims

1. A computing system comprising: a network interface; at least one processor; a non-transitory computer-readable medium; and program instructions stored on the non-transitory computer-readable medium that are executable by the at least one processor to cause the computing system to: transmit to a computing device an indication of a first portion of a lesson plan, wherein the lesson plan comprises a plurality of educational

a network interface, at least one processor, a non-transitory computer-readable medium, and program instructions stored thereon. The program instructions are executable by the at least one processor to cause the computing system to: (1) transmit to a computing device an indication of a first portion of a lesson plan, wherein the lesson plan comprises a plurality of educational content, (2) receive from the computing device via the network interface activity data comprising progress data indicating a progression through the first portion of the lesson plan, (3) based at least on the progress data, determine that the progression through the first portion of the lesson plan exceeds a progress threshold, and (4) based at least on determining that the progression exceeds the progress threshold, transmit to the computing device an indication of a second portion of the lesson plan.

[0029] In another aspect, a computing device is provided. The computing device comprises a network interface, at least one processor, a non-transitory computer-readable medium, and program instructions stored thereon. The program instructions are executable by the at least one processor to cause the computing device to: (1) receive from a computing system via the network interface an indication of a first portion of a lesson plan, wherein the indication of the first portion of the lesson plan comprises a plurality of identifiers of respective educational content, (2) based on the received indication of the first portion of the lesson plan, transmit to one or more third-party content providers a request for educational content, wherein the request for educational content comprises at least one identifier from the plurality of identifiers, and (3) receive from the one or more third-party content providers educational content identified by the at least one identifier.

[0030] In yet another aspect, a method is provided. The method involves a computing system: (1) assigning a lesson plan to a student profile, wherein the lesson plan comprises a plurality of educational content, (2) transmitting to a computing device corresponding to the student profile an indication of a first portion of a lesson plan, wherein the indication of the first portion of the lesson plan comprises at least one installation command indicating a command for the computing device to install educational content from a third-party content provider, (3) receiving from the computing device activity data comprising progress data indicating a progression through the first portion of the lesson plan, (4) based at least on the progress data, determining that the progression through the first portion of the lesson plan exceeds a progress threshold, and (5) based at least on determining that the progression exceeds the progress threshold, transmitting to the computing device an indication of a second portion of the lesson plan.

[0031] In another aspect, a computing system is provided. The computing system comprises a network interface, at least one processor, a non-transitory computer-readable medium, and program instructions stored thereon. The program instructions are executable by the at least one processor to cause the computing system to: (1) determine an expected number of content licenses projected to be used within a first predetermined duration of time; (2) transmit to a plurality of computing devices via the network interface a plurality of installation commands, wherein a given installation command indicates a command for a given computing device to utilize a given content license to obtain educational content from a given third-party content provider; (3) receive from the plurality of computing devices a plurality of progress data, wherein each progress data indicates a progression through a given lesson plan; (4) based at least on the received progress data, determine an expected number of content licenses projected to be used within a second predetermined duration of time; and (5) transmit to the plurality of computing devices via the network interface a second plurality of installation commands.

[0032] In reading this specification, one of ordinary skill in the art will understand that this disclosure includes numerous other embodiments, such as systems configured to perform, methods that involve, and computer-readable media comprising instructions to execute some of the above-mentioned operations as well as additional operations discussed below.

II. Example Network Configuration

[0033] FIG. 1 shows an example network configuration 100 in which one or more embodiments disclosed herein may be practiced or implemented. As shown, the network configuration 100 may include one or more student devices 110, a content deployment system ("CDS") 120, and one or more content providers 130. A communication network 140 may communicatively couple these network components. The network configuration 100 may include more or less of the illustrated network components and/or additional network components not illustrated.

configured to transmit activity data after determining that Annie's progression through the lesson plan exceeds a progress threshold. For instance, the progress threshold may be a position within the lesson plan, such as a "buffer zone." In particular, the position may indicate that the number of remaining study units, activities, or problems is below a particular value or that an expected amount of time before Annie completes the current portion of the lesson plan is below a particular duration.

[0101] In other examples, a trigger to transmit activity data may be an indicator of Annie's comprehension of the lesson plan. For instance, the student device 110 may be configured to transmit activity data after inferring that Annie understands the material and needs to be further challenged. In particular, the student device 110 may determine that Annie's progression through the lesson plan exceeds a first progress threshold, such as an expected pace of progression by Annie through the first portion of the lesson plan or a particular score value (e.g., percentage or number of correct answers on Pre-Quiz 1, Activity 1, and/or Activity 2). On the other hand, the student device 110 may also be configured to transmit activity data after inferring that Annie is struggling with the material. In particular, the student device 110 may determine that Annie's progression through the lesson plan is below a second progress threshold based on Annie's pace, scores, and/or other performance indicators. Other examples are also possible.

[0102] In practice, any of the progress thresholds described herein may be determined based on a student's personalized lesson plan. As such, some students may have different progress thresholds than other students. Moreover, a given progress threshold may be predetermined or dynamically determined by the CDS 120. For example, a predetermined progress threshold may be part of a lesson plan that is provided to or otherwise accessed by the CDS 120. Alternatively, a dynamic progress threshold may be dynamically determined by the CDS 120 based on a number of considerations, such as a student's progress data and/or assessment data, among other examples. In particular, the CDS 120 may be configured to utilize one or more algorithms to generate a given dynamic progress threshold. Other examples are also possible. In some cases, a given lesson plan may include both dynamic and predetermined progress thresholds.

[0103] In some implementations, instead of the student device 110 transmitting activity data to the CDS 120, the student device 110 may be configured to transmit 506 to the CDS 120 a request for an additional portion of the personalized lesson plan 400 (e.g., an additional study unit), additional educational content from the personalized lesson plan 400 (e.g., in a scenario where the student device 110 already received the whole set of sequence information and activity instructions) or an updated lesson plan (e.g., in a scenario where the student device 110 infers that the current lesson plan is too difficult or too easy). For instance, in some examples, the student device 110 may be configured to transmit such a request after determining that Annie's progression through the lesson plan exceeds or is below a progress threshold, as just discussed.

[0104] In any event, the CDS 120 may be configured to receive from the student device 110 activity data that includes the progress data and device identifier. Based on the received activity data, the CDS 120 may be configured to determine whether the student device 110 requires additional or different educational content or perhaps a new lesson plan altogether. In examples, this determination may involve the CDS 120 determining that the student device 110 has a limited amount of educational content that remains to be completed, that Annie understands the material and needs to be further challenged, and/or that Annie is struggling with the material, which may be determined similar in some respects to the above discussion. For instance, the CDS 120 may be configured to determine whether Annie's progression through the lesson plan exceeds or is below any of the above-discussed progress thresholds.

[0105] In the event that the CDS 120 determines that Annie's progression through the first portion of the personalized lesson plan (e.g., study unit 408) indicates that new or additional educational content is currently needed or will be needed in the future (e.g., based on a determination that the progression exceeds or is perhaps below a predetermined threshold), the CDS 120 may be configured to then determine a second portion of the personalized lesson plan 400 that should be provided to the student device 110. Alternatively, the CDS 120 may make this determination based on receiving from the student device 110 a request for an additional portion of the personalized lesson plan. That is, in some examples, the student device 110 may itself instruct the CDS 120 that an additional portion of the lesson plan is needed.

[0106] Additionally or alternatively, the CDS 120 may be configured to determine a second portion of the personalized lesson plan 400 that should be provided to the student device 110 based on a number of other considerations. That is, the CDS 120 may be configured to determine the second portion of the personalized

lesson plan based on considerations other than Annie's progress through the first portion of the lesson plan. In this way, the CDS 120 may determine and then provide to the student device 110 instructions regarding the second portion of the lesson plan before Annie needs additional content, perhaps even before Annie starts the first portion of the lesson plan.

[0107] For example, the CDS 120 may be configured to perform this operation based on an installation state of the student device 110. That is, the CDS 120 may determine the second portion of the personalized lesson plan 400 after determining that the student device 110 has installed all or some threshold portion of the educational content called for by the first portion of the personalized lesson plan 400. The CDS 120 may make such a determination based on installation data that it receives from the student device 110 that the student device 110 transmits to indicate educational content it has installed.

[0108] In another example, the CDS 120 may be configured to determine the second portion of the lesson plan based on whether the student device 110 has received from the CDS 120 all or some threshold portion of the installation commands corresponding to the first portion of the lesson plan 400. In such an example, the student device 110 may be configured to transmit command receipts to the CDS 120 indicating that the student device 110 successfully received an installation command, and the CDS 120 may be configured to perform this operation based on such received command receipts. Other examples are also possible.

[0109] In any event, the CDS 120 may determine the second portion of the lesson plan in a number of manners. For instance, the CDS 120 may be configured to perform this operation by referencing the sequence column 402 of the personalized lesson plan 400 and determining the study unit that follows the current study unit 408. For example, the CDS 120 may determine that the second portion of the lesson plan should be or include study unit 410.

[0110] Additionally or alternatively, the CDS 120 may be configured to determine the second portion of the lesson plan based on the progress data received in the activity data. For instance, if the progress data indicates that Annie is progressing through her lesson plan at an above average pace (or at least quicker than expected) and/or with an above average comprehension, then the CDS 120 may determine that the second portion of the lesson plan should be or include a study unit that is different from study unit 410. On the other hand, if the progress data indicates that Annie is struggling with the material (e.g., a below average pace and/or scores), the CDS 120 may determine the second portion of the lesson plan should include some of the activities and/or educational content from the first portion of the lesson, activities and/or content similar to those of the first portion of the lesson, and/or aspects of study unit 410. Other examples are also possible. In this way, the CDS 120 may be configured to update the original lesson plan based on Annie's progression through the first portion of the lesson plan.

[0111] After the CDS 120 determines the second portion of the lesson plan, the CDS 120 may be configured to determine the educational content, if any, that the student device 110 will need to download in order to allow Annie to work through the second portion of the lesson plan. This determination may involve the CDS 120 utilizing the device identifier received in the activity data. In particular, the CDS 120 may be configured to locate the device profile of the student device 110 using the received device identifier and determine the educational content currently installed on the student device 110. In the example where the second portion of the lesson plan is study unit 410, the CDS 120 may determine that the educational content currently installed on the student device 110 includes the CDS Application and Applications A, B, and C, and so Applications D, E, and F need to be downloaded.

[0112] Thereafter, the CDS 120 may be configured to transmit 507 an indication of the second portion of the personalized lesson plan to the student device 110. Generally, the indication of the second portion of the personalized lesson plan may include any information required by the CDS application to assemble the second portion of the personalized lesson plan. An example of this indication may include the sequence information associated with activities from study unit 410, activity instructions for the activities in study unit 410, removal commands for Applications B and C, and installation commands for Applications D, E, and F. In this example, the indication does not include a removal command for Application A because that application is needed for playback of Video 2.

[0113] In some examples, the CDS 120 may be configured to generate, and then include in the indication of the second portion of the personalized lesson plan, removal commands based on the number of available

content licenses, among other considerations. For instance, if the CDS 120 determines that the number of available content licenses is above a predetermined threshold number, then the CDS 120 may forgo generating removal commands. On the other hand, if the CDS 120 determines that the number of available content licenses is at or below the predetermined threshold number, then the CDS 120 may generate the removal commands. Accordingly, continuing off the above example, in some cases Application A may also be removed and/or one or both of Applications B and C may remain installed on the student device 110.

[0114] In any event, the student device 110 may be configured to receive the indication of the second portion of the personalized lesson plan 400 and then automatically use the CDS application to assemble the second portion of the lesson plan. As part of this process, similar to the process for assembling the first portion of the lesson plan, the student device 110 may be configured to utilize the received network locators to download 508 educational content (e.g., Applications D, E, and F) from one or more of the content providers 130.

[0115] Additionally, the student device 110 may be configured to remove previously installed educational content, such as Applications B and C, in accordance with the received removal commands. In some cases, this operation may involve the student device 110 un-installing the educational content and then transmitting un-install data to the CDS 120 and/or third-party content provider 130. By doing so, the student device 110 frees up content licenses that were being used by these two installed applications, which may allow the student device 110 and/or other student devices to utilize those content licenses.

[0116] In some instances, the student device 110 may be configured to determine that it does not have the educational content that is called for by Annie's personalized lesson plan. For example, Annie may progress through her personalized lesson plan quicker than expected, and Annie may finish with all the educational content stored on the student device 110 before the CDS 120 and/or content providers 130 provide additional educational content to the student device 110.

[0117] Similarly, the student device 110 may be additionally or alternatively configured to determine that it failed to receive educational content called for by Annie's personalized lesson plan. That is, the student device 110 may determine that, despite transmitting the request for a given educational content, the student device 110 has yet to receive the given educational content, which could have been a result of network connection problem or some other reason. This determination may involve the student device 110 determining that a predetermined threshold amount of time has elapsed since the student device 110 transmitted the request for educational content.

[0118] In such instances, the student device 110 may be configured to perform a number of operations that aim to help continue Annie's personalized learning experience. For example, the student device 110 may be configured to re-initiate downloading missing educational content. In another example, the student device 110 may be configured to additionally or alternatively transmit an alert message to a teacher or staff device. In yet another example, the student device 110 may be additionally or alternatively configured to replace the missing educational content with locally stored educational content or content that is otherwise currently available to the student device 110, such as content available through websites and the like. For instance, the student device 110 may be configured to determine educational content, activities, or specific problems that Annie has yet to complete and incorporate that material into her personalized lesson plan until additional content is available. In some cases, the student device 110 may be configured to determine activities or specific problems that Annie has struggled with or answered incorrectly and incorporate that material into her personalized lesson plan.

[0119] In other examples, the student device 110 may be additionally or alternatively configured to replace the missing educational content with "backup" educational content that otherwise is not used in the lesson plan. In particular, in such examples, the CDS 120 may be configured to include backup educational content in a given indication of a portion of a lesson plan, such as the indication of the first portion of the lesson plan. The CDS 120 may include backup educational content when the student device 110 does not have a predetermined amount of backup content. In any event, the student device 110 may then be configured to install the backup educational content and utilize it if the student device 110 determines that the student device 110 does not have content called for by the personalized lesson plan. After Annie completes the backup educational content, the student device 110 may be configured to send to the CDS 120 a backup request for new backup educational content.

[0120] In some examples, the student device 110 may be additionally or alternatively configured to skip the missing educational content altogether and perhaps move on to other educational content, such as a post-quiz. In some cases, the student device 110 may be configured to do so if the completed activities exceed a threshold, such as a threshold percentage complete or threshold score. Other examples are also possible.

[0121] In some cases, the CDS 120 may be configured to facilitate obtaining missing educational content. For example, the student device 110 may be configured to provide installation data to the CDS 120 indicating one or more educational content that have been installed by the student device 110. The student device 110 may do so periodically or each time that the student device has installed educational content.

[0122] Based on the received installation data and a transmitted indication of a portion of the lesson plan (e.g., the indication of the first portion of the lesson plan), the CDS 120 may be configured to determine educational content that the student device 110 has yet to install. For example, the CDS 120 may be configured to compare the installed educational content indicated by the received installation data with the educational content that the CDS 120 instructed the student device 110 to download via installation commands provided in the indication of the first (or second) portion of the lesson plan.

[0123] If the CDS 120 determines that the student device 110 has yet to install one or more educational content that it should have installed, the CDS 120 may be configured to transmit to the student device 110 installation commands for the student device to install the one or more educational content. In this way, the CDS 120 instructs the student device 110 to re-attempt the download.

[0124] In practice, some of the above-discussed operations may be repeated as Annie continues using her student device 110 to progress through her personalized lesson plan 400 and/or when Annie wishes to start a new personalized lesson plan. In practice, some or all of the above-discussed operations may also be performed when another student wishes to utilize the student device 110 once Annie is finished for the day.

[0125] In examples, a computing device or system may perform a combination of some of the operations described above to carry out an example method. For instance, FIG. 6 illustrates an example method 600 that may be carried out by a computing system, such as the CDS 120, and FIG. 7 illustrates an example method 700 that may be carried out by a computing device, such as the student device 110. In some implementations, the CDS 120 and student device 110 may concurrently perform methods 600 and 700, respectively.

[0126] For the methods illustrated and disclosed herein, the flow diagrams show functionality and operations of one possible implementation. Although the blocks are illustrated in sequential order, these blocks may be performed in parallel and/or in a different order than those described herein. Also, the various blocks may be combined into fewer blocks, divided into additional blocks, and/or removed and/or additional blocks may be added based upon the desired implementation.

[0127] In some examples, each block may represent circuitry that is wired to perform the specific logical functions in the method. In other examples, each block may represent a module, segment, or portion of program code that includes instructions that are executable by a processor to perform specific logical functions or operations in the method. The program code may be stored on any type of computer-readable medium, such as a storage device. The computer-readable medium may include non-transitory computer-readable medium, such any form of volatile or non-volatile storage media. The computer-readable medium may be considered a computer-readable storage medium, for example, or a tangible storage device.

[0128] As shown in FIG. 6 at block 602, the method 600 may involve the CDS 120 assigning a lesson plan to a student profile, such as the student profile associated with the student device 110, where the lesson plan includes at least a plurality of educational content. At block 604, the method 600 may involve the CDS 120 transmitting to a computing device, such as the student device 110, an indication of a first portion of the lesson plan. At block 606, the method 600 may involve the CDS 120 receiving from the computing device activity data that includes at least progress data indicating a progression through the first portion of the lesson plan. At block 608, the method 600 may involve the CDS 120, based at least on the progress data, determining that the progression through the first portion of the lesson plan exceeds a progress threshold. At block 610, the method 600 may involve the CDS 120, based at least on determining that the progression exceeds the progress threshold, providing to the computing device an indication of the second portion of the

lesson plan.

[0129] Turning to FIG. 7, at block 702, the method 700 may involve the student device 110 transmitting to a computing system, such as the CDS 120, a lesson plan request that includes at least a device identifier. At block 704, the method 700 may involve the student device 110 receiving from the computing system an indication of a first portion of a lesson plan, where the indication of the first portion of the lesson plan includes at least a plurality of identifiers of respective educational content. At block 706, the method 700 may involve the student device 110, based on the received indication of the first portion of the lesson plan, transmitting to one or more content servers, such as third-party content providers, a request for educational content, where the request for the educational content includes at least one identifier from the plurality of identifiers. At block 708, the method 700 may involve the student device 110 receiving from the one or more content servers educational content. At block 710, the method 700 may involve the student device 110 determining that a progression through the first portion of the lesson plan exceeds a progress threshold. At block 712, the method 700 may involve the student device 110, based on the progression exceeding the progress threshold, transmitting to the computing system a request for a second portion of the lesson plan.

[0130] Although the above operations were discussed in relation to interactions between Annie's student device 110 and the CDS 120 and/or content providers 130, one of ordinary skill in the art will appreciate that the same or similar operations may occur concurrently with multiple other student devices. Indeed, in examples, the CDS 120 may be configured to make lesson plan determinations and/or to perform other operations based on classroom-, school-, or district-wide considerations.

[0131] For example, the CDS 120 may be configured to predict a school district's educational content needs, and thus required number of content licenses, for a particular period of time. That is, the CDS 120 may be configured to predict what content and how much of that content a school district may require over a period of time. Based on such predictions, the CDS 120 may be configured to intelligently and automatically purchase or otherwise acquire content licenses on behalf the school district, perhaps taking advantage of bulk purchase or other discounts. Thereafter, the CDS 120 may assign content licenses to student accounts or student devices, and students can then receive personalized educational content as described above.

[0132] Broadly speaking, the CDS 120 may be configured to make such predictions at a student level. For example, the CDS 120 may be configured to predict the needs of each student within the school district and use such predictions to make a district-wide prediction. As such, the CDS 120 may be configured to utilize historical, simulated, and/or current data to make such predictions. The CDS 120 may be configured to store or communicate with another system that provides such data.

[0133] As for historical data, the CDS 120 may be configured to make predictions based on past license purchases by the school district, past student enrollment numbers for the school district, and/or past student assessment and/or progress data corresponding to students within the school district, among other considerations. Additionally or alternatively, the CDS 120 may be configured to utilize similar information from other school districts. Current data may include some or all of the same types of data as the historical data.

[0134] With respect to simulated data, the CDS 120 (or a service provider) may be configured to simulate district-wide license usage. In particular, the CDS 120 may be configured to simulate how students may progress through personalized lesson plans, thereby determining what content is likely to be required and thus how many licenses that should be purchased.

[0135] In practice, the CDS 120 may be configured to determine an expected number of content licenses projected to be used within a predetermined duration of time. For instance, the CDS 120 may be configured to determine an initial license-purchase prediction that indicates a predicted number of content licenses that a given school district may require for a predetermined period of time. In examples, the predetermined duration of time may be a number of weeks, a number of months, a first half of a school year, or some other amount of time. For purposes of example and explanation only, the below discussion assumes an exemplary predetermined duration of time of four weeks.

[0136] In practice, determining the initial-license purchase prediction may involve identifying the students that are enrolled at a school within the school district for a given school year. This operation may involve the

CDS 120 receiving or identifying a previously received student roster for each school within the school district. Generally, a student roster may indicate student identifiers of each student enrolled to attend a school within the school district for a given school year. Such a roster may be uploaded to the CDS 120 via a school-district computing device or a service provider the school district utilizes, among other examples.

[0137] Thereafter, the CDS 120 may be configured to determine initial needs of each identified student. This operation may involve the CDS 120 accessing the student profiles for each identified student in the student profile database 312. Then, for each student profile, the CDS 120 may access any personalized lesson plans for the given student and analyze the educational content that is called for by the personalized lesson plans.

[0138] The CDS 120 may be configured to project each student's respective progress through the personalized lesson plans over the first four weeks of the school year. This operation may involve the CDS 120 evaluating several considerations, such as a given student's assessment data, historical or simulated progress data for the educational content called for in the given student's personalized lesson plans, and/or historical progress data of the given student in prior school years, among other considerations. From this projection, the CDS 120 may then determine the educational content that the given student is expected to need in the first four weeks of the school year.

[0139] The CDS 120 may be configured to attribute certain weights to the determined educational content based on the status of the activity associated with the educational content. For instance, educational content that is associated with an activity that is "fixed" (e.g., one that a student is required to perform, such as Videos 1 and 2 and Activity 3 from FIG. 4) may be attributed a first weight, such as a "1", while educational content associated with an activity that is "optional" (e.g., one that the student may or may not perform based on his or her discretion, such Activities 1, 2, 4, and 5 from FIG. 4) may be attributed a second weight, such as a "1/2". Other example weights are also possible. In practice, the particular weights may be predetermined when a lesson plan is created or determined based on historical student data, among other possibilities. In any event, the CDS 120 may be configured to sum the various weights attributed to each of the determined educational content.

[0140] Additionally, the CDS 120 may be configured to determine a per-device factor that may reduce the weight attributed to the educational content. This operation may involve the CDS 120 analyzing a number of considerations, such as the number of students enrolled in the school district, the number of student devices owned by the school district, and/or the school district's student-device implementation model, to determine a maximum number of student devices that the educational content needs to be on at any given time.

[0141] A student-device implementation model indicates how students utilize student devices in a given school district. In particular, the student-device implementation model may indicate the number of students assigned to a given student device. For example, a student-device implementation model where each student is assigned his or her own student device may have a per-device factor of "1", while an implementation model where two students share a student device and those two students are projected to need the same educational content around the same time may have a per-device factor of "1/2". The CDS 120 may be configured to attribute the per-device factor to the weight attributed to the corresponding educational content. For example, the CDS 120 may multiply the weight by the per-device factor.

[0142] Alternatively, a per-device factor may affect the weight in other manners. For example, Student A and Student B may share Student Device 1, Student C and Student D may share Student Device 2, and Students A, B, and D may each need Video Z for their respective personalized lesson plans. The CDS 120 may be configured to determine that two content licenses for educational content Video Z are needed as opposed to three licenses (based on a per-student basis) or 1.5 licenses (based on the CDS 120 being configured as the previous example). The CDS 120 may be configured to utilize per-device factors in other manners as well.

[0143] The CDS 120 may be configured to then determine a weighted total for each student and from that, determine a total for the whole school district. In examples, the CDS 120 may be configured to round up any fractional totals, while in other examples the CDS 120 may round down. Additionally or alternatively, the CDS 120 may be configured to add a predetermined prediction buffer, such as a percentage of the determined total (e.g., 20%), to the total for the whole school district.

[0144] In any event, the CDS 120 may be configured to purchase or otherwise acquire a number of content

licenses equal to the determined school-district total. In some examples, before purchasing the licenses, the CDS 120 may be configured to further modify the total or perhaps perform a wholly new initial prediction (e.g., that projects for more or less than the first four weeks of the school year) based on considerations such as a yearly budget, a remaining budget, a maximum at-one-time spending amount, costs of educational content, bulk discounts, and/or any temporary discounts, among other considerations.

[0145] Thereafter, the CDS 120 may be configured to assign the purchased content licenses to student accounts or student devices and transmit respective installation commands to the student devices, thereby allowing student devices to obtain educational content for personalized lesson plans. As such, a given installation command may indicate a command for a given student device to utilize a given content license to obtain educational content from a given content provider 130, where the given content license is one from the purchased content licenses. Moreover, the CDS 120 may also transmit to another computing system (e.g., a content provider 130, such as Apple's iTunes.RTM. store) assignment information that indicates particular licenses that have been assigned to a given student device or student account.

[0146] As discussed above, as students progress through their respective personalized lesson plans, the student devices may be configured to transmit activity data to the CDS 120. The CDS 120 may in turn be configured to receive from multiple student devices activity data that includes at least respective progress data.

[0147] At some point in time, based at least in part on received progress data, the CDS 120 may be configured to determine another license-purchase prediction that indicates a predicted number of content licenses that the school district may require for the ensuing four weeks. In practice, the CDS 120 may be configured to perform this operation in response to a number of triggers. For example, the CDS 120 may be configured to determine license-purchase predictions periodically, perhaps at the end of each school week or after some other threshold amount of time. In other examples, the CDS 120 may perform this operation based on a determination that the number of remaining available (e.g., unassigned) content licenses is below a predetermined threshold. Other triggers are also possible.

[0148] In any event, the CDS 120 may be configured to determine this license-purchase prediction in a similar manner as it determined the initial-license purchase prediction as discussed above. However, to determine the needs of each student, the CDS 120 may be configured to additionally or alternatively utilize received progress data for the corresponding student. For instance, the CDS 120 may be configured to project a given student's progress through his or her personalized lesson plans over the next four weeks of the school year based on the given student's current pace and performance indicators, among other considerations. Moreover, the CDS 120 may be configured to account for any changes to lesson plans and/or curriculum goals.

[0149] Further, the CDS 120 may be configured to determine the degree at which the student devices are currently reusing content licenses. For example, as discussed above, the CDS 120 may receive un-install data from the student devices, and from that information, the CDS 120 may determine a district-wide reuse efficiency. From this determination, the CDS 120 may determine a reuse scale factor that may modify the school-district total for the current license-purchase prediction. As such, the CDS 120 may be configured to dynamically determine a reuse scale factor. In other examples, the CDS 120 may instead be configured to utilize a predetermined reuse scale factor (e.g., one that was predetermined based on reuse information from one or more previous years). Other examples are also possible.

[0150] After the CDS 120 determines the school-district total, the CDS 120 may be configured to subtract the number of purchased licenses that are currently available, and/or perhaps that may become available within a given time period, from the school-district total and then purchase or otherwise acquire the resulting number of content licenses. Then, the CDS 120 may be configured to assign purchased content licenses to student accounts or student devices, thereby allowing student devices to obtain educational content for personalized lesson plans, as discussed above.

[0151] In some examples, the CDS 120 may be configured to modify a given license-purchase prediction based on a previously determined full academic-year prediction. For instance, the CDS 120 may perform a full academic-year prediction before or at the start of a given school year in line with the above discussion. Such a prediction may provide an approximate estimate of the total number of licenses a school district may

[0160] While some examples described herein may refer to operations performed by given actors, such as "users", "students", "teachers", and/or other entities, this description is for the purposes of example and explanation only. Accordingly, the claims should not be construed to require action by such actors unless the claim language itself explicitly recites such actors performing the actions.

VI. Conclusion

[0161] The description above discloses, among other things, various example systems and device that include, among other components, software executed on hardware. It should be understood that such examples are merely illustrative and should not be considered as limiting. For example, it is contemplated that any or all of the hardware and/or software aspects may be embodied exclusively in hardware, exclusively in software, or in any combination of hardware and/or software. Accordingly, the systems, devices, and methods described above may be implemented differently than the above discussion.

[0162] Additionally, references herein to "embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment can be included in at least one example embodiment of an invention. The appearances of this phrase in various places in the specification are not necessarily all referring to the same embodiment, nor are separate or alternative embodiments mutually exclusive of other embodiments. As such, the embodiments described herein, explicitly and implicitly understood by one skilled in the art, can be combined with other embodiments.

[0163] When any of the below claims are read to cover a purely software and/or firmware implementation, at least one of the elements in at least one example is hereby expressly defined to include a tangible, non-transitory medium such as a memory, DVD, CD, Blu-ray, and so on, storing the software and/or firmware.

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