Shih, J. L. et al. (Eds.) (2019). Proceedings of the 27th International Conference on Computers in Education.
Taiwan: Asia-Pacific Society for Computers in Education

Simulatable Open Learner Models of Core Competencies for Setting Goals for Course Performance

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Abstract: A competency-based curriculum involves courses for cultivating core competencies required for specific professions to enable students to take courses to cultivate their core competencies. This paper presents a curriculum level and competency-based learning analytics dashboard system with simulatable open learner models (OLMs) of core competencies for assisting students in setting goals for course performance. At first, the system provides students with their OLMs of core competencies based on their taken courses and grades. After that, students are asked to set their goals for course grades of all their courses during the current semester. The system displays the simulation of students' future OLMs if they achieve their goals for course grades this semester. Students can re-set their goals and conduct the simulation of OLMs again until they satisfy the simulation results. The system also enables students to set detailed goals for attendance, assignment hand-in rate, midterm exam, and final exam in order to achieve their goals for course grade. A preliminary evaluation was conducted. Most students agreed that the simulatable OLMs assisted them in understanding the influence of their goals for course grades on core competencies and in setting goals for course grades. Most students also stated that setting detailed course goals prompted them to achieve the goal for course grade.

Keywords: Open learner models, core competencies, goal setting, competency-based curriculum, learning analytics dashboard system

1. Introduction

Higher education has increasingly adopted competency-based curricula to cultivate students' core competencies required for specific professions (Burke, 1989). A competency-based curriculum involves an outcome-based approach for defining students' outcome of specific core competencies, designing and implementing a curriculum for cultivating these core competencies, evaluating students' outcome, and reflecting on and regulating the curriculum, faculty teaching, and student learning. Researchers developed a curriculum level and competency-based learning analytics dashboard system, named VACC (Visualized Analysis of Core Competencies), to build and display students' open learner models (OLMs) of core competencies to assist students in reflecting on their core competencies and setting goals regarding taking additional courses (Chou et al. 2017). OLMs are inspectable, co-operative, editable, or negotiated visualized representations of system diagnosis of student learning (Bull, 2004) and are designed for promoting students' metacognitive processes, such as awareness, reflection, and self-assessment (Bull & Kay, 2013; Chou et al. 2015; Mitrovic & Martin, 2007). This paper presents a function of simulatable OLMs added in VACC for assisting students in setting goals for course performance.

2. Simulatable OLMs of Core Competencies for Setting Goals for Course Performance

A function of simulatable OLMs of core competencies was added in VACC for assisting students in setting goals for course performance. When students log in to VACC and choose the function of simultable OLMs of core competencies, the system lists the courses they have taken during the current semester and asks them to set their goals for course grades. For example, Figure 1 shows that a student took the course *CS554* and set 90 as his/her goal for course grade. After setting goals for course grades of all taken courses, students can push the button of "simulation" to inspect the simulation of future OLMs if they achieve their goals for course grades this semester.

Figure 1. Setting goals for course grade and simulation of future OLM

Figures 2 illustrate a simulation of OLM of quality of a student. The OLM of quality displays the student's grade point average (GPA) of courses relevant to each core competency. Blue area indicates the current OLM and orange line indicates the simulation of future OLM if the student achieves his/her goals for course grades in all taken courses this semester. The simulation shows that the student's future OLM of quality will slightly decrease in six core competencies. If the student does not satisfy the simulation result, the student can re-set his/her goals for course grades and conduct the simulation again. Figure 3 illustrates a simulation of OLM of ranking of quality. The ranking is calculated by comparing the student to all graduates, ranging from 0 (the best) to 1 (the worst). The simulation shows that the student's future OLM of ranking of quality will increase in two core competencies but decrease in five core competencies. The result indicates that graduates averagely performed better than the student's goals for course grades on the courses related to the five core competencies. The student can increase his/her goals for course grades on the courses related to the five core competencies and conduct the simulation again.

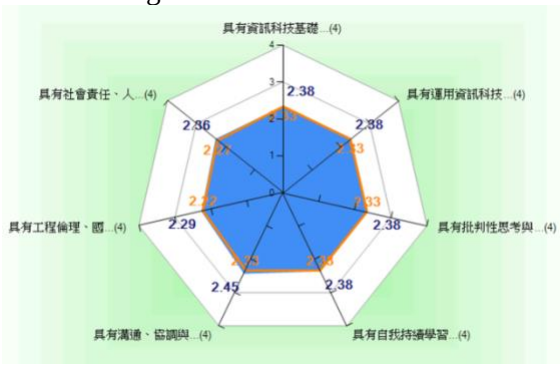

Figure 2. Simulation of OLM of quality

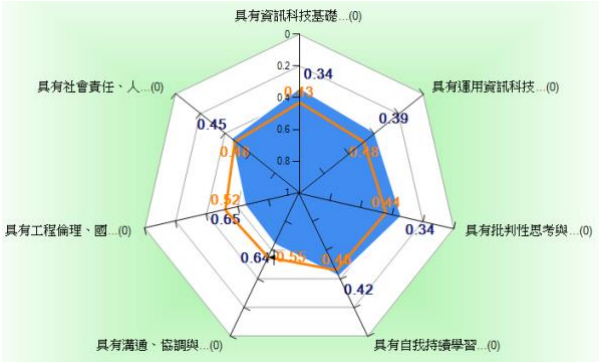

Figure 3. Simulation of OLM of ranking of quality

After setting goals for course grades, students are asked to set detailed course goals to achieve the grade goals for the taken courses. Setting detailed goals for courses includes goals for attendance, assignment hand-in rate, midterm exam, and final exam. For example, Figure 4 shows that the student set 95% as his/her goal for attendance, 100% as his/her goal for assignment hand-in rate, 80 as his/her goal for midterm exam, and 80 as his/her goal for final exam to achieve his/her goal for grade that was set as 90. Detailed course goals are used to prompt students to study to achieve their goals for course grade.

Figure 4. Setting detailed goals for a course

3. Evaluation

An evaluation was conducted to evaluate the simulatable OLMs. The participants were 77 undergraduate students. They were asked to log in to VACC to inspect their OLMs of core competencies, set their grade goals for their taken courses, and conduct the simulation of future OLMs. Then they set detailed course goals to achieve their goals for course grades. At last, they were asked to fill out a questionnaire with five 5-Likert scale items. Table 1 lists the questionnaire results. Most students agreed (strongly agree and agree) that the simulatable OLMs assisted them in understanding the influence of their goals for course grades on core competencies (75%, item #1) and in setting goals for course grades (70%, item #2). Most students (72%) expressed that they will re-set their goals for course grades if the simulation result of future OLMs is not good (item #3). Most students (78%) stated that they set their goals for course grades after much deliberation (item #4). Most students (70%) agreed that setting detailed course goals prompted them to achieve the goal for course grade (item #5).

Table 1. *Results of questionnaire*

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
#1 The simulatable OLMs assisted me in understanding the influence of my goals for course grades on core competencies.	15 (19%)	43 (56%)	17 (22%)	1 (1%)	1 (1%)
#2 The simulatable OLMs assisted me in setting goals for course grades.	15 (19%)	39 (51%)	19 (25%)	2 (3%)	2 (3%)
#3 I will re-set goals for course grades if the simulation of future OLMs is not good.	14 (18%)	41 (53%)	18 (23%)	3 (4%)	1 (1%)
#4 I set my goals for course grades after much deliberation.	17 (22%)	43 (56%)	14 (18%)	2 (3%)	1 (1%)
#5 Setting detailed course goals prompted me to achieve the goal for course grade.	18 (23%)	36 (47%)	20 (26%)	1 (1%)	2 (3%)

4. Summary

This paper presents a learning analytics dashboard system with simulatable OLMs of core competencies for assisting students in setting goals for course grades. The system enables students to inspect their OLMs of core competencies, set goals of course grades in their taken courses, and view the simulation of future OLMs of core competencies to understand the influence of their goals for course grades on core competencies. Students can re-set their goals for course grades and conduct the simulation of future OLMs until they satisfy the simulation result. The system also enables students to set detailed goals in order to achieve their goals for course grade. The results of questionnaire showed that most students expressed that the simulatable OLMs assisted them in setting goals for course grades.

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