The E-Learning Skills Gap Study: Initial Results of Skills Desired for Persistence and Success in Online Engineering and Computing Courses

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Abstract

The use of e-learning systems provides great benefits for individuals worldwide, from facilitation of formal education to training individuals on different topics. E-learning systems are becoming critical platforms for educational institutions, corporations, to government agencies. However, it has been well documented that success and persistence in e-learning courses are substantial challenges, while some individuals struggle to stay on top of course activities. We hypothesize that the core problem is misalignment between the skills students should have to become successful in online courses, the skills that instructors report students have, versus what skills students claim they should have, and skills students claim that they actually have. Thus, the aim of this study is to develop a hierarchical E-Learning Skills Index (ELSI) to measure such gap. The first phase in this four-phased research seeks to uncover instructors' identified skills that students should have in order to become successful in e-learning courses. Moreover, online instructors were asked to allocate percentages for the importance of the skills for the development of the benchmarking index. A total of 46 instructors provided their perspectives, where the results of this phase are presented here. The paper concludes with discussions and outline of the next phases of this research.

Keywords: Skills in e-learning courses, instructors' perspectives of students' skills, e-learning skills gap, benchmarking index for e-learning skills.

Introduction

For over a decade, there has been a growing concern about students' persistence and success in e-learning courses (Beaudoin, Kurtz, & Eden, 2009; Deschacht, & Goeman, 2015). Specifically, this sentiment is expressed due to the reporting of questionable persistence and employability of those who graduate from online programs; while it appears they e-learning students gain critical skills needed for the digital workforce (Perry, Boman, Care, Edwards, & Park, 2008). Skills are the cornerstone of what enable individuals to be successful in their daily activities, be it work, hobbies, or educational endeavors. Skills enable individuals to be competent in what they do, while learning and enhancing skills has been documented as an important life experience from early age to adulthood (Fletcher, & Wolfe, 2016). In their seminal work, Boyatzis and Kolb (1991) defined skill as "combination of ability, knowledge and experience that enables a person to do something well" (p. 280). When it comes to learning, skills are required to ensure success in any form of human development and their career, while appear to be important in e-learning courses as well (Levy & Ramim, 2015). Multiple studies have been conducted about various factors that contribute to persistence and student success in e-learning courses (Bawa, 2016; Deschacht, & Goeman, 2015; Geri, 2012; Levy, 2007; Perry et al., 2008, Willging, & Johnson, 2009). However, the aspect of skills and the skill gap between what skills individuals *should have* and what skills *they actually have*, have not been well studied in that context. Moreover, those who teach or facilitate e-learning appear to have a desired set of skills that they *expect*

their students to have, while it maybe somewhat different than what they observe *student to actually have*. Additionally, e-learning has been very productive in recent years enabling e-learning opportunities that have not been previously available (Hylton, Levy, & Dringus, 2016; Koohang, Paliszkiewicz, Nord, & Ramim, 2014). Moreover, the use of e-learning systems provide great benefits for individuals worldwide, including helping educate and provide training on different topics from focused educational programs, to general hobbies (Koohang & Paliszkiewicz, 2013; Keh, Wang, Wai, Huang, Hui, & Wu, 2008). E-learning systems are becoming critical platform for educational institutions, but similarly for corporations, and for general life-long learning (Beaudoin, Kurtz, & Eden, 2009; Levy & Ramim, 2015). However, it has been well documented that persistence in e-learning courses is a substantial problem, while some individuals struggle to stay on top of course activities (Gafni & Geri, 2010; Levy & Ramim, 2012). We hypothesize that part of the problem is due to misalignment between the skills that instructors indicate that students should have to become successful in e-learning courses (i.e. complete the e-learning course with good grade), compared to the skills that students report to have, vs. what skills students claim they should have, and what the skills they claim that they actually have (See Table 1). Thus, this study was set as the first phase in a four-phase research that seeks to uncover instructors' identified skills that students should have in order to become successful in e-learning courses. Moreover, instructors were asked to allocate percentages for the importance of the skills in order to develop a hierarchical E-Learning Skills Index (ELSI), as a benchmarking index to assess such skill gap. The two main research questions driving this phase of the study are indicated below.

Table 1. E-Learning Skills Gap Taxonomy

Skills needed to be successful and persist in e-learning courses?	By Instructors	By Students
Should have?	What skills they (students) should have?	What skills we (students) should have?
Have?	What skills they (students) have?	What skills we (students) have?

RQ1: What are the instructors' ***identified skills*** that students *should have* in order to become successful in e-learning courses (i.e. pass the course successfully)?

RQ2: What are the instructors' ***identified weights of the skills*** in the level of importance that students *should have* that enable a validated hierarchical aggregation to the E-Learning Skills Index (ELSI), the proposed benchmarking index?

Methodology

This research is designed as a four-phased study (See Figure 1), where the first phase is reported in this paper, which includes the perspectives of instructors on the skills that students ***should have*** and their identified weights to become successful in e-learning courses (i.e. complete the course successfully). An online anonymous survey instrument was designed to capture expert panel feedback on the set of skills, recommendations for additional skills, and their weights of importance within the three identified categories of: a) learning skills, b) independent skills, and c) research skills. Appendix A includes a draft of the survey used for this phase of the e-learning skills gap study. Additionally, Table 2 provides a list of skills identified from prior literature grouped under three proposed categories. Both the list of the skills along with the categories were subject to the evaluation of the instructors in this phase of the research.

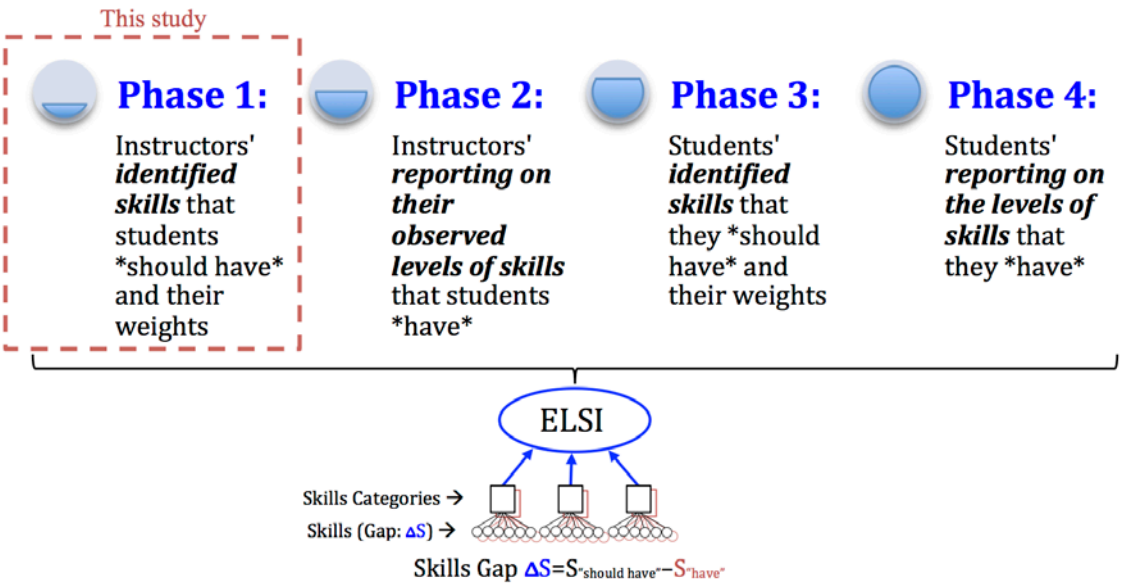

Figure 1. Four-Phased Research for Development of the E-Learning Skills Index (ELSI)

Table 2. Skill Areas and Proposed Skill Categories

Skills Category	Skill Number	Skill Area	Source(s)
Learning Skills	A1.	Knowledge acquisition	Jugdev & Wishart, 2014; Morcke, Dornan & Eika, 2012; Oblinger, 2003
	A2.	Information seeking	Keh et al., 2008; Koh et al., 2010; Levy & Ramim, 2015
	A3.	Notes taking	Koohang et al., 2014
	A4.	Content practice	Geri, 2012; Koohang & Paliszkiewicz, 2013
	A5.	Utilization of online course resources	Koohang & Paliszkiewicz, 2013
	A6.	Interactions with the instructor	Koohang et al., 2014; Oblinger, 2003
	A7.	Communication	Koohang et al., 2014
Independent Skills	B1.	Critical thinking	Noy, Raban, & Ravid, 2006; U.S. Department of Education, 2013
	B2.	Independent task completion	Hylton, Levy, & Dringus, 2016; Merhout, Havelka, & Hick, 2009
	B3.	Questions asking initiative	Litecky, Aken, & Prabhakar, 2009
	B4.	Scheduling of tasks (non procrastination)	Gafni & Geri, 2010; Levy & Ramim, 2012; Merhout et al., 2009
	B5.	Socialization with other students	Oblinger, 2003; Jugdev, & Wishart, 2014
	B6.	Solving technical difficulties	Berendonk, Stalmeijer, & Schuwirth, 2013; Litecky et al., 2009; Merhout et al., 2009
Research Skills	C1.	Information gathering	Levy & Ramim, 2015; Keh et al., 2008; Koh et al., 2010
	C2.	Information aggregation	Litecky et al., 2009; Merhout et al., 2009
	C3.	Academic writing	Bailie & Jortberg, 2009; Litecky et al., 2009; Merhout et al., 2009
	C4.	Oral presentation	Jugdev & Wishart, 2014; Merhout et al., 2009; Rubin & Dierdorff, 2009
	C5.	Information processing/analysis	Bronsburg, 2011; Carlton & Levy, 2015; Levy & Ramim, 2015; Keh et al., 2008; Koh et al., 2010; Merhout et al., 2009

Initial Results

Prior to sending out the survey instrument to instructors, 12 subject matter experts (SMEs) were asked to review the instrument and provide any recommendations on the instructions to the participants, categories, skills, and overall clarity of the text. The SMEs included individuals with over 15 years of experience in e-learning both from the teaching and administration side. Several minor textual adjustments were made based on the feedback, and two original skills were grouped to a single one (C5), while added example was added in parentheses for another skill for clarity (B4). Following the adjustments, the instrument was sent to 115 instructors from the fields of computing, engineering, and management of information systems areas from the United States, Europe, and Israel who teach online. A total of 46 (40%) instructors provided their perspective, where the results of this initial stage towards the hierarchical index development are presented below. Table 3 provides the demographic distribution of the participants.

Table 3. Demographic Distribution of the Participating Instructors (N = 46)

	Frequency	Percentage (%)
Gender		
Females	25	54%
Males	21	46%
Age Category		
25-34	2	4.3%
35-39	2	4.3%
40-44	8	17.4%
45-49	13	28.3%
50-54	7	15.2%
55-59	6	13.0%
60-64	4	8.7%
65 or above	4	8.7%
Number of years teaching online (or hybrid) courses		
Below one year	2	4.3%
1-2 years	2	4.3%
2-4 years	8	17.4%
4-6 years	7	15.2%
6-8 years	7	15.2%
8-10 years	6	13.0%
10 or more years	14	30.4%
Average number of students teaching online (& hybrid) yearly		
Below 50	15	32.6%
50 to 74	7	15.2%
75 to 99	8	17.4%
100 to 124	5	10.9%
125 to 149	1	2.2%
150 to 174	2	4.3%
175 to 199	0	0.0%
200 to 249	3	6.5%
250 to 300	1	2.2%
Above 300	4	8.7%

Additionally, Figures 2a, 2b, and 2c provide the aggregated weights (%) of the specific skill areas within each of the three corresponding categories of respectively and the standard deviation associated with each.

As part of this phase of the study, we provided area for the participating instructors to provide additional feedback. One instructor indicated for A5 – Utilization of Online Course Resources that "Really don't understand how they could complete any course tasks without using online course resources." To that effect, in some instances online instructors report that few students don't read or use course resources at all, just focus on the graded assignments, and submit whatever they deem applicable for the assignment so they can get a passing grade without using the course resources. Additionally, we have asked each instructor to provide us any additional skills that they find valid. Within the A category of Learning Skills, four instructors indicated they would like to include: Technological Literacy (10%), Communication (as the ability to transfer the acquired knowledge) 10%, Comprehension (10%), and Memorization (20%). Within the B category of Independent Skills, one instructor recommended the "Solving of non-technical problems (5%)" as an added skill. Within the C category of Research Skills, there were no additional skills provided, while two instructors recommended in the overall feedback area that they would like to recommend "Usage of ELS" as an added skill, however, did not provide percentages for the level of importance that skills area should play.

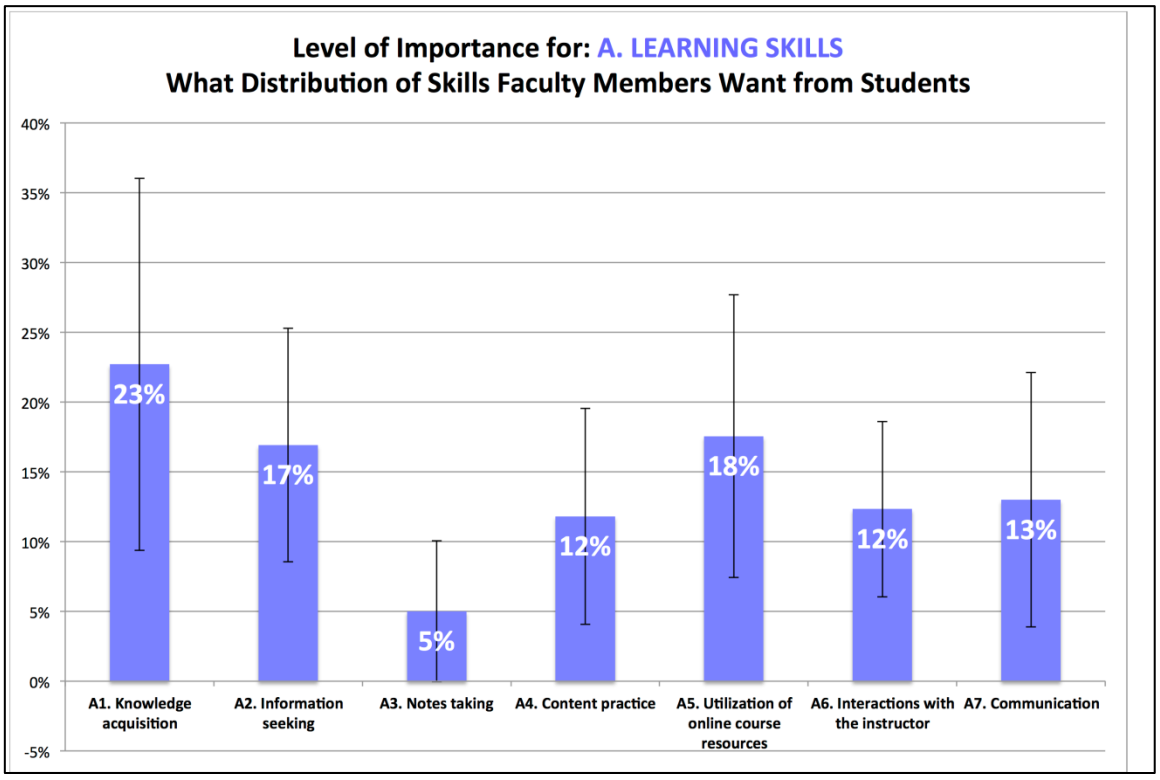

Figure 2a. Learning Skills Category – Skills that are Important for Instructors in E-Learning Computing Courses

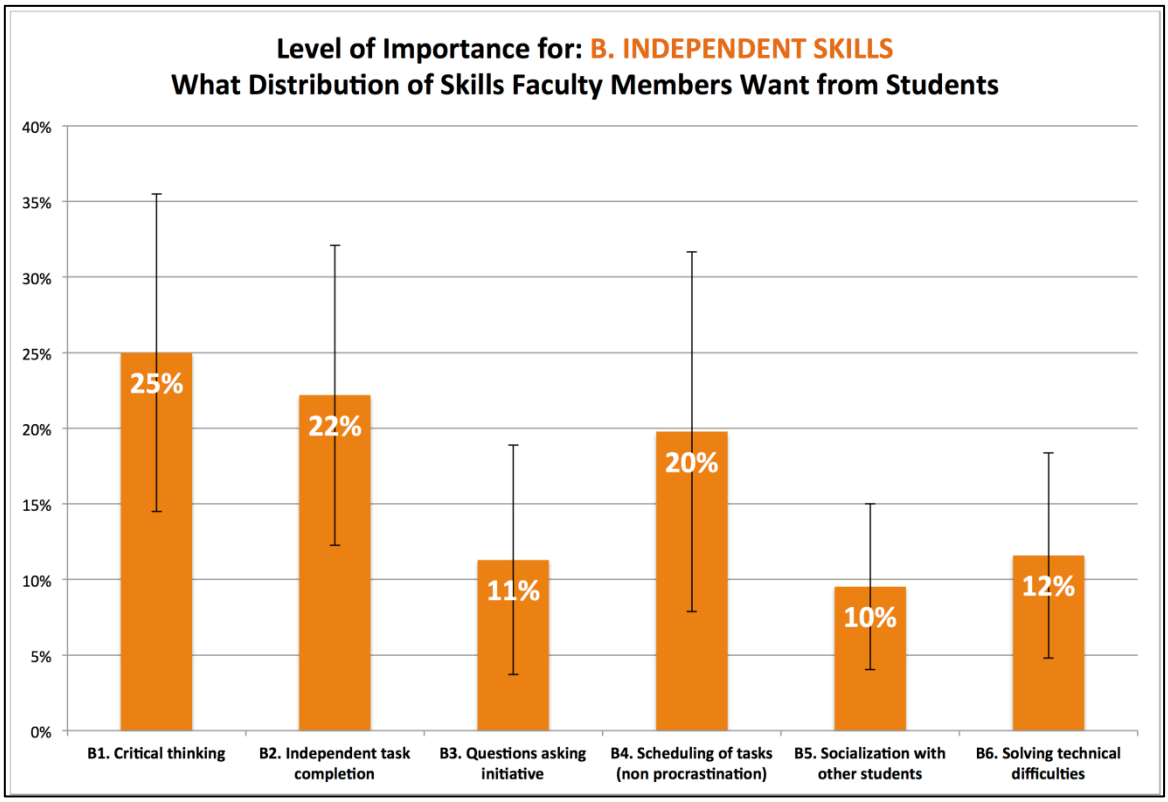

Figure 2b. Independent Skills Category – Skills that are Important for Instructors in E-Learning Computing Courses

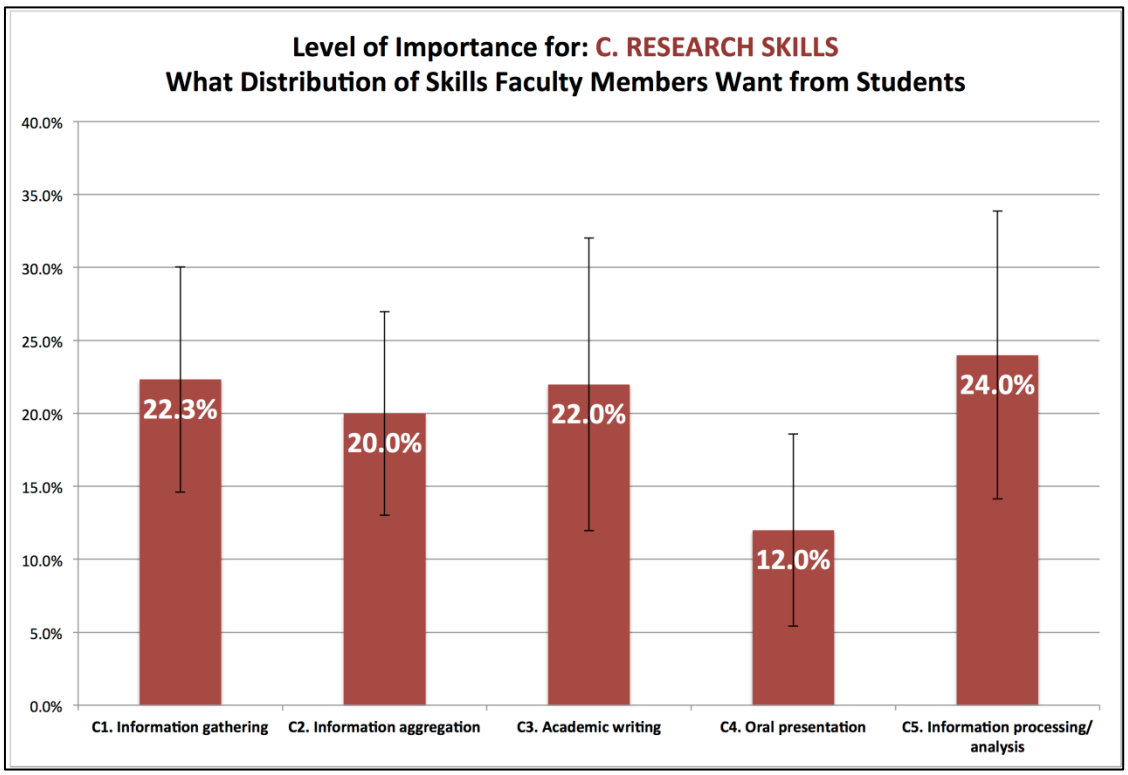

Figure 2c. Research Skills Category – Skills that are Important for Instructors in E-Learning Computing Courses

Discussions, Conclusions, Limitations, and Future Research

We have set an overall plan for a four-phased research related to the skill gap in e-learning courses, when it comes to instructors' perspectives versus students' perspectives on skills during online courses. This specific paper discusses the first phase where feedback on the set of skills and the level of importance of such skills in the context of successfully completing e-learning courses were gathered from 46 instructors. Within the first category of Learning Skills, *knowledge acquisition* was reported to be the most important skill, while *notes taking* was the least important skill indicated by instructors. In the category of Independent Skills, *critical thinking* was reported to be the most important skills, and *socialization with other students* was the least important among the skill surveyed. The third category of Research Skills, had relatively equal distribution among four out of the five skills, which included *information gathering*, *information aggregation*, *academic writing*, and *information processing/analysis* (with 20% to 24%), while *oral presentation* was indicated as the least important skill by the instructors participated in this study. As with any research, this initial phase of the research study had several limitations, among its most noticeable one is the sample size.

While this is the first of four-phases of the study, some interesting findings are already emerging from what skills instructors are expecting that their students should have, while future work in this stream of research will seek to assess students' perspective on what skills they think are important to have when studying online. Doing so, will enable the development of a hierarchical E-Learning Skills Index (ELSI) that will allow the empirical measurement of skills both instructors observe their students have, and students report on themselves. Using that ELSI, future work will empirically assess both the level of skills that instructors report their students have, and comparing it to the level of skills that students report they have when they study online. Finding that skill gap between what instructors expect students to have and what they report that their students demonstrate, compared with what skills students indicate they should have, and what they indicate they have in e-learning courses appear to be critically important, as it can help ensuring that students finish courses successfully, but also learn the competencies needed to be successful in life.

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Appendix A – E-Learning Skills Gap Study: Phase 1 – Survey Instrument of Online Learning Instructors and Professors

Dear Online Instructors and Professors,

We are contacting you as an expert in the field of teaching online seeking your help with a research that we are conducting. As an online instructor/professor, you have experienced the problem of having attrition in your online courses, while other students struggle to stay on top of course activities. We feel that part of the problem is due to misalignment between the *skills* that instructors indicate that students should have to become successful in online courses (i.e. complete the online course with 'good' grade), compared to the *skills* that students report to have, vs. what *skills* students claim they should have, and what the *skills* they claim that they actually have.

Thinking more simply about it as:

By Instructors:

1) What skills they (students) should have?

2) What skills they (students) have?

By Students:

3) What skills we (students) should have?

4) What skills we (students) have?

As part of this research, we have complied a list of skills from prior literature, which we hope are relevant, and placed them under three tentative categories. We are asking your assistance in this phase in helping us:

1. Decide what skills should be included in our list as part of the skills that students *should have* to become successful in online learning courses (i.e. complete the course)

2. Provide us with weights on what you think is the importance (by distributing the 100% across the skills category you find important. Should you wish to exclude a skill in the current list, feel free to place a 0% next to it. If you are proposing more skills, allocate less than 100% for the current total, and type the proposed weight next to your newly proposed skill (i.e. New Skill Proposed 1: X%).

We want to remind you that we consider a skill as: "combination of ability, knowledge, and experience that allow someone to complete a task successfully"

Thank you for agreeing to participate in this exploratory research study.

A. LEARNING SKILLS

(Ensure all skills in the A category add up to 100%):

Example: If you located 20% to A1, 70% to A2, and 10% to A3, all the rest should be 0%.

A1. Knowledge acquisition (Allocate 0% to 100%) _____%

A2. Information seeking (Allocate 0% to 100%) _____%

A3. Notes taking (Allocate 0% to 100%) _____%

A4. Content practice (Allocate 0% to 100%) _____%

A5. Utilization of online course resources (Allocate 0% to 100%) _____%

A6. Interactions with the instructor (Allocate 0% to 100%) _____%

A7. Communication (Allocate 0% to 100%) _____%

A8. New Skill? If more than one, type as "New Skill 1 (10%), New Skill 2 (5%)" (Allocate 0% to 100%, If none, type "None")

Your answer:_____

B. INDEPENDENT SKILLS

(Ensure all skills in the B category add up to 100%):

B1. Critical thinking (Allocate 0% to 100%) _____%

B2. Independent task completion (Allocate 0% to 100%) _____%

B3. Questions asking initiative (Allocate 0% to 100%) _____%

B4. Scheduling of tasks (non procrastination) (Allocate 0% to 100%) _____%

B5. Socialization with other students (Allocate 0% to 100%) _____%

B6. Solving technical difficulties (Allocate 0% to 100%) _____%

B7. New Skill? If more than one, type as "New Skill 1 (10%), New Skill 2 (5%)" (Allocate 0% to 100%, If none, type "None")

Your answer:_____

C. RESEARCH SKILLS

(Ensure all skills in the C category add up to 100%):

C1. Information gathering (Allocate 0% to 100%) _____%

C2. Information aggregation (Allocate 0% to 100%) _____%

C3. Academic writing (Allocate 0% to 100%) _____%

C4. Oral presentation (Allocate 0% to 100%) _____%

C5. Information processing/analysis (Allocate 0% to 100%) _____%

C6. New Skill? If more than one, type as "New Skill 1 (10%), New Skill 2 (5%)" (Allocate 0% to 100%, If none, type "None")

Your answer:_____

D. Additional Recommendations

D1. What changes would you make in the categorizations of the skills, either in terms of moving skills between categories (indicate which skill & to which category) or making new categories (indicate name of category & proposed new skills within it).

Your answer:_____
_____
_____
_____

E. Tell us a bit about you...

E1. Gender *

- ☐ Female
- ☐ Male

E2. Age category

- ☐ 24 or below
- ☐ 25 to 34
- ☐ 35 to 39
- ☐ 40 to 44
- ☐ 45 to 49
- ☐ 50 to 54
- ☐ 55 to 59
- ☐ 60 to 64
- ☐ 65 or above

E3. Number of years teaching online courses

- ☐ Below one year
- ☐ 1-2 years
- ☐ 2-3 years
- ☐ 4-6 years
- ☐ 7-8 years
- ☐ 9-10 years
- ☐ 10 or more years

E4. Average number of students teaching online yearly

- ☐ Below 50
- ☐ 50 to 74
- ☐ 75 to 99
- ☐ 100 to 124
- ☐ 125 to 149
- ☐ 150 to 174
- ☐ 175 to 199
- ☐ 175 to 199
- ☐ 200 to 249
- ☐ 250 to 300
- ☐ Above 300