

Core Competences in Agri-food Sustainability: Student Self-Assessment After Online Action-Learning

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Abstract

The need to cultivate student competences to improve sustainability in agrifood systems is indisputable. This paper shows the example of an online student competition course in Sustainable Food for Master students based on action-learning principles and the five core competences of Observation, Participation, Dialogue, Visioning, and Reflection. The course ran three times from 2019-2022 and 85 students assessed themselves in these five competences by responding to 17 rating statements. Analyses revealed significant improvement in all competences except Participation after the course. Yet since Participation was highest rated before the course, rating of this competence was not less than other competences at the end. Practicing these five core competences and integrating competency self-assessments into educational activities can contribute to a paradigm shift in education that fosters the cultivation of competences for sustainability and that may be applicable to other courses.

Keywords: *Competence development; education for sustainable development; student competition.*

1. Introduction

Improving sustainability in agri-food and forestry systems requires a new educational approach that cultivates student competences enabling them to take responsible action and become changemakers (UNESCO, 2017). In action-learning, experiences form the basis of learning, and knowledge is produced through reflection on the experiences. Thus, action-learning aims at shifting the focus of the learning process from knowledge to competences and from theory to experience.

This competence-based action-learning educational strategy has been adopted by the NextFood project (*H2020 No 771738*) which aims to educate the next generation of professionals in the agri-food system through, in part, a shift from linear to cyclical learning. The strategy requires that learners practice five core competences essential for being a changemaker. These five are defined as follows:

Table 1. The Five Core Competences

Competence	Short Definition
Observation	carefully examining situations in the “world out there” in an unbiased manner
Participation	joining a task, not as a distant observer, but rather with personal commitment and dedication
Visioning	creating images of desired future states
Reflection	exploring and examining ourselves, our perspectives, attributes, experiences, actions, and interactions
Dialogue	accessing the collective intelligence of a group

Source: adapted from (Laenerts et al., 2019).

In the online student competition course in Sustainable Food, “FoodFactory-4-Us”, students practice the core competences in six training sessions and in at-home assignments. This practice can take the form of written exercises, e.g., for Reflection students answer a series of thought questions after each session. Oral assignments are however more common as working together during the sessions, rather than listening to a lecture, is an aim of action-learning, e.g., for Dialogue and Participation students work in random groups and assign roles in order to complete a short, timed assignment.

Evaluating the success of any learning methodology may be approached in several ways, from written teacher evaluations to machine-graded examinations and many other options. Student self-assessment of their own learning, particularly in competency-based food system education, has been favored recently as it produces rich datasets that both students and

teachers can use for furthering their goals (Galt et al., 2013). A recent review of 74 studies using project-based learning in a variety of academic disciplines, suggests that student self-assessment, including of competences such as those studied here e.g., teamwork, can contribute to courses in fields as varied as biology and hotel administration (Guo et al., 2020).

In this study, three online competition courses followed a competency-based action-learning format and collected data from student self-assessments in order to evaluate student perception and performance of five core competences.

2. Methods

2.1. Competition Course

An online student competition course in Sustainable Food, “FoodFactory-4-Us,” ran three times between 2019 and 2022. The course was completely voluntary and teams of between three and five Master students applied with a 100-word project description following a widely publicized open call. An Advisory Board selected up to 10 teams for each competition. There was no cost for student teams to participate in the competition and students received no university credit for their participation.

Each competition lasted approximately five months and contained six online trainings of between 1 and 1.5 hours followed by a final virtual conference where student teams gave a 10-minute presentation of their projects and answered questions from the audience. The competition winner was decided based on presentation performance as well as a written report and “participation” which included attendance at online sessions and completion of the evaluations which provide the data for this study.

2.2. Data Collection

Students completed a quantitative self-assessment after the first course session, called “Self-Assessment Start”, and the same self-assessment at the end of the competition, called “Self-Assessment End”. Here, students reviewed 17 statements (three or four discrete aspects for each of the five core competences) and rated their level for each one on a scale of 1 (novice) to 9 (expert). Some statements were very direct, e.g., “Carefully observe a situation” and “Empathize with the goals and feelings of group members” for the competences of Observation and Participation, respectively. Others were more descriptive, e.g., “Understand the processes that enhance a group's ability to identify today's critical challenges and envision a desired future state” for Visioning. The five core competences were introduced in the first course session and practiced throughout the course and a couple of sentence description of each of the nine rating levels was provided both at the Start and End Self-Assessments.

2.3. Data Analysis

Self-assessment rankings were averaged for each of the three or four questions on each competence for each student. Then, overall averages and standard error of the mean (SEM) were calculated for each of the five competences. One way ANOVA followed by Tukey-Kramer post hoc was used to check for significant differences among ratings of the five competences both for Self-Assessment Start and Self-Assessment End. Student t-test with the Bonferroni correction for multiple t-tests compared overall Start and End ratings of all students for each of the five competences.

3. Results and Discussion

3.1. Students

Overall, 84 students completed Self-Assessment Start out of 106 students who started the competition course and 85 completed Self-Assessment End of the 89 who completed the competition course as follows:

Table 2. Demographics of Student Self-Evaluation of Competences

Variable	Comp 1	Comp 2	Comp 3	Total
Self-Assessment Start/End	39/40	30/31	15/14	84/85
Start: Male/Female	19/20	8/22	4/11	31/53
End: Male/Female	19/21	8/23	6/8	33/52
Start: Inside/Outside EU	37/2	15/15	5/10	57/27
End: Inside/Outside EU	37/3	16/15	5/9	58/27

The demographic breakdown in Table 1 indicates an average of 39% more females than males and 53% more students based in the EU than outside completing the Self-Assessments. The numbers also show that most students who began the competition and completed Self-Assessment Start, finished the competition and also completed Self-Assessment End. It has indeed been suggested that high dropout rates in online courses can be decreased by, among other interventions, using pre- and post-testing (Laato et al., 2019). The very high retention rate in this competition course suggests that students found the course, with its start and end rating self-assessments and multiple written and oral assessments (not presented here), to be a worthwhile experience despite the voluntary nature.

3.2. Student Self-Assessments

A one-way ANOVA compared self-assessment ratings for the five competences at the start and at the end of the course. Each student's responses to the three or four questions about each competence were averaged to eliminate bias error from the same respondent. At the start, the significant difference among ratings for the five competences was very high at $p = 4.1 \cdot 10^{-7}$, and the Tukey-Kramer Post Hoc revealed Participation to be rated significantly higher than all other competences ($p < 0.05$). At the end of the course, ratings were barely significantly different at $p = 0.05$, and the Tukey-Kramer Post Hoc revealed that Participation was significantly higher than only Observation and that there were no significant differences between any other competences (Fig. 1).

These five competences were expressed in everyday and easy-to-understand language in the Self-Assessment document where e.g., Dialogue is defined as follows: "Dialogue is a tool to access the collective intelligence of a group. Dialogue enables us to ask difficult questions and examine the assumptions behind our thinking." However, the application of these competences to daily academic life is not always obvious and that may explain why students at the start of the course rated themselves highest in Participation, which is commonly stressed in academia. In fact, a recent review evaluated practices to improve student in-class participation over 50 years of attention to this competence, beginning in 1958 (Rocca, 2010). For competences like Visioning and Reflection, on the other hand, this competition course may very well be the first time students were introduced to these concepts.

To compare Start and End self-assessment ratings for each of the five individual competences, the Student t-test with the Bonferroni correction for multiple t-tests ($\alpha_{adj}=0.01$) was used. Here, students rated themselves as significantly improved ($p < 1.4 \cdot 10^{-7}$) in all skills except Participation, where they found no improvement ($p=0.03$). However, students had already rated themselves as more skilled in Participation than in the other competences so, although the Participation rating did not improve, Participation was not rated lower than the other competences at the end of the course.

These individual comparisons suggest that students found the six online trainings of the competition course useful for improving their abilities in the core competences of Dialogue, Observation, Reflection, and Visioning. Online learning has in fact been shown to be as effective as in-person learning, and particularly for younger people online courses are the preferred delivery method (Borun et al., 2010). Evidence for improvements in the more esoteric core competences such as Visioning were seen both in the Self-Assessment and also in student responses to open-ended questions, as exemplified by this comment, "Visionary thinking, as it is more important. It's from this creative thinking that we get different alternatives for the problems being faced by us, to think and act differently from others."

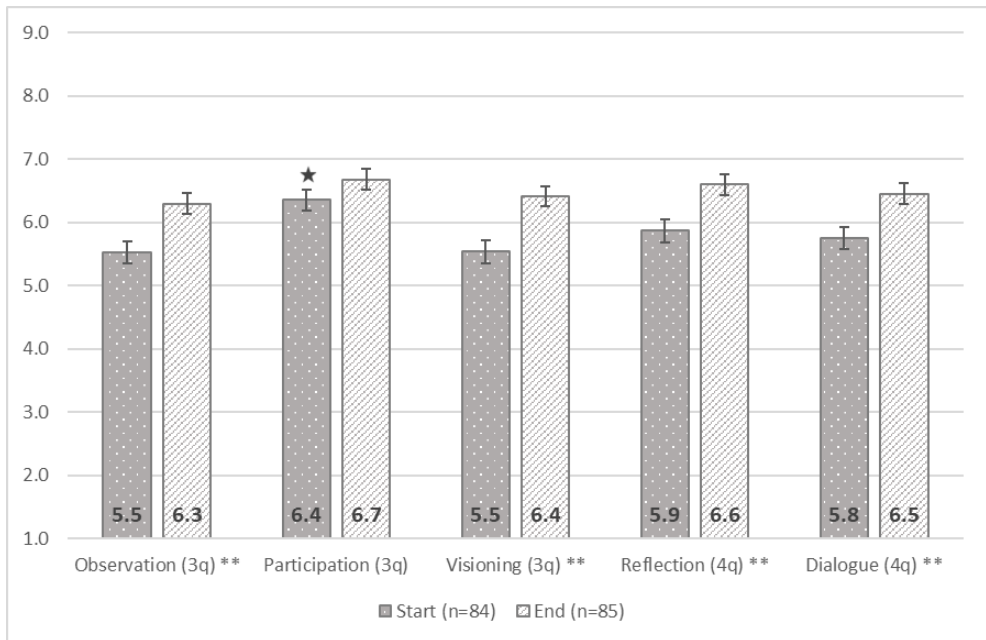


Figure 1. Average self-assessment +/- SEM of the five core competences at the start and the end of the course shows significant increases in four of the five at the course's end. (3q) or (4q) indicates number of questions about that competence. * indicates significance at 0.05 and ** indicates significance at 0.001

4. Conclusion

Training of the core competences Dialogue, Observation, Participation, Reflection, and Visioning in an online action-learning setting led to significant improvements in student self-evaluation of their expertise in these competences. Participation may be the most accessible competence as students viewed their expertise highest here even before the six online sessions which trained the five competences. Competency training through project-based learning may be applicable in many academic disciplines. Teaching students to improve their performance in these core competences through action-based courses offers a way to train the sustainability leaders of tomorrow.

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