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Perspectives and reflections of prospective teachers on home-base agriculture practical training in a restrictive environment on the tropical island of Tobago: A case study

William Mollineau[1] and Trevor Garcia[2]

[1]Centre for Education Programmes (CEP), The University of Trinidad and Tobago (UTT), Point Lisas Campus, Point Lisas, Trinidad, Republic of Trinidad and Tobago

[2]CEP, UTT, Tobago Campus, Scarborough, Tobago, Republic of Trinidad and Tobago

ABSTRACT: This paper surveyed a class of Prospective Teachers reading a 13-week agricultural course in the Bachelor of Primary Education Degree at The University of Trinidad and Tobago, Centre for Education Programmes, Tobago Campus. Data were collected pre and post course delivery. The paper discusses the results of the respondents. Major findings include the preference for crops over animals and the desire of the student teachers to incorporate the concepts of container gardening and indigenous animal knowledge in their classrooms. The students' knowledge of Tobago's indigenous animals were better than comparative groups in other geographic regions. It was concluded that the home-based container gardening approach may be successfully used for continuity of agricultural practical training of prospective teachers during periods where access to face-to-face teaching and learning are restricted.

KEYWORDS: Container gardening, indigenous animals, practical-based agriculture, online learning.

1 BACKGROUND

Primary education activities were impacted by the COVID-19 pandemic during the first quarter of 2020. In some territories teaching and learning processes were shifted from the physical environment to the virtual world. Therefore, adjustments were needed for the continuity of learning [1]. These challenges were more severe for the delivery of practical-based courses such as agriculture. The major concern was the practical component where innovative delivery and assessment modes were required. Changes in what students learn and how they are taught are critical and teacher education programmes must reconsider courses and curriculum to prepare teacher candidates to understand and implement any new standards [2]. Online participation had a positive impact on pre-service primary school teachers [3]. Benefits included lessons' adaptation and critical self-assessment. Garden activities were reported as having highly positive effects on self-esteem [4]. Students reflected that practical pedagogical training makes a crucial contribution to their education and would guide their development as educators [5]. Prospective teachers also expressed the thrills they experienced during exploration and getting the practice-oriented knowledge [6] in their agricultural courses while pursuing pedagogy degrees [7]. Supervised home gardening had several additional benefits to pupils over the use of the school gardens, such as development of agricultural skills, family food security, independent learning and reflection, and entrepreneurship opportunities [8]. The latter authors also recommended that home gardens should be included in the learning experience of pupils in primary schools, particularly in developing countries where access to physical classrooms are challenging. The importance of practical training was articulated by Agricultural Science teachers [9], and in other academic fields such as Veterinary Science [10]. Before prospective teachers begin their teaching careers at primary schools their competence must include adequate demonstration skills which they should acquire from their practical and pedagogical training ([11], [12]).

This paper analyzes the perspectives and reflections of prospective teachers to home-based agriculture training at UTT during a pandemic. These practical pedagogies are partial fulfillment for a B.Ed. Primary Education on the tropical island of

Tobago. The article also highlights the potential for these home-based practical, and online instructions and assessments as future elements of a teacher training programme in a restrictive environment and or where logistics to classrooms are exigent.

2 MATERIALS AND METHODS

The research was conducted with a class of twenty-eight prospective teachers reading a 13-week agricultural course in the Bachelor of Primary Education Degree at The University of Trinidad and Tobago (UTT), Centre for Education Programmes (CEP), Tobago Campus. Data were collected pre and post course delivery. Tobago (300 km^2 or 120 ml^2) is an island (Figure 1) located in the Caribbean and is the smaller of the twin-island state of the Republic of Trinidad and Tobago, and has a population of 60,874 [13]. Trinidad, the larger island is 5,131 km^2 (1,981 ml^2) with a population of 1,406,531. Tobago is located 35 km (22 ml) northeast of Trinidad and about 160 km (99 ml) off the northeastern coast of Venezuela. It also lies to the southeast of Grenada.

The course was delivered during Semester I (September to December 2020). Due to the COVID-19 pandemic restrictions the course was shifted from a face to face mode to an online mode (synchronous and asynchronous). The major topics covered included:

- Field and Container Gardening (CG)
- Neo-tropical animals
- Teaching agriculture
- Agribusiness
- Agricultural technology

2.1 PRE-COURSE DATA COLLECTION

Information was collected via SurveyMonkey survey consisting of 21 questions (Appendix 1). Three (3) open ended questions were included, each asking the respondent to list three (3) responses to the question. Data was gathered beginning one week before and ending two days prior to the first online class.

2.2 POST-COURSE DATA COLLECTION

At the end of the final online session the students were asked to reflect on the following.

- What were your course experiences and impressions of the course during the semester?
- How do you plan to include any ONE of the concepts learnt in your teaching?

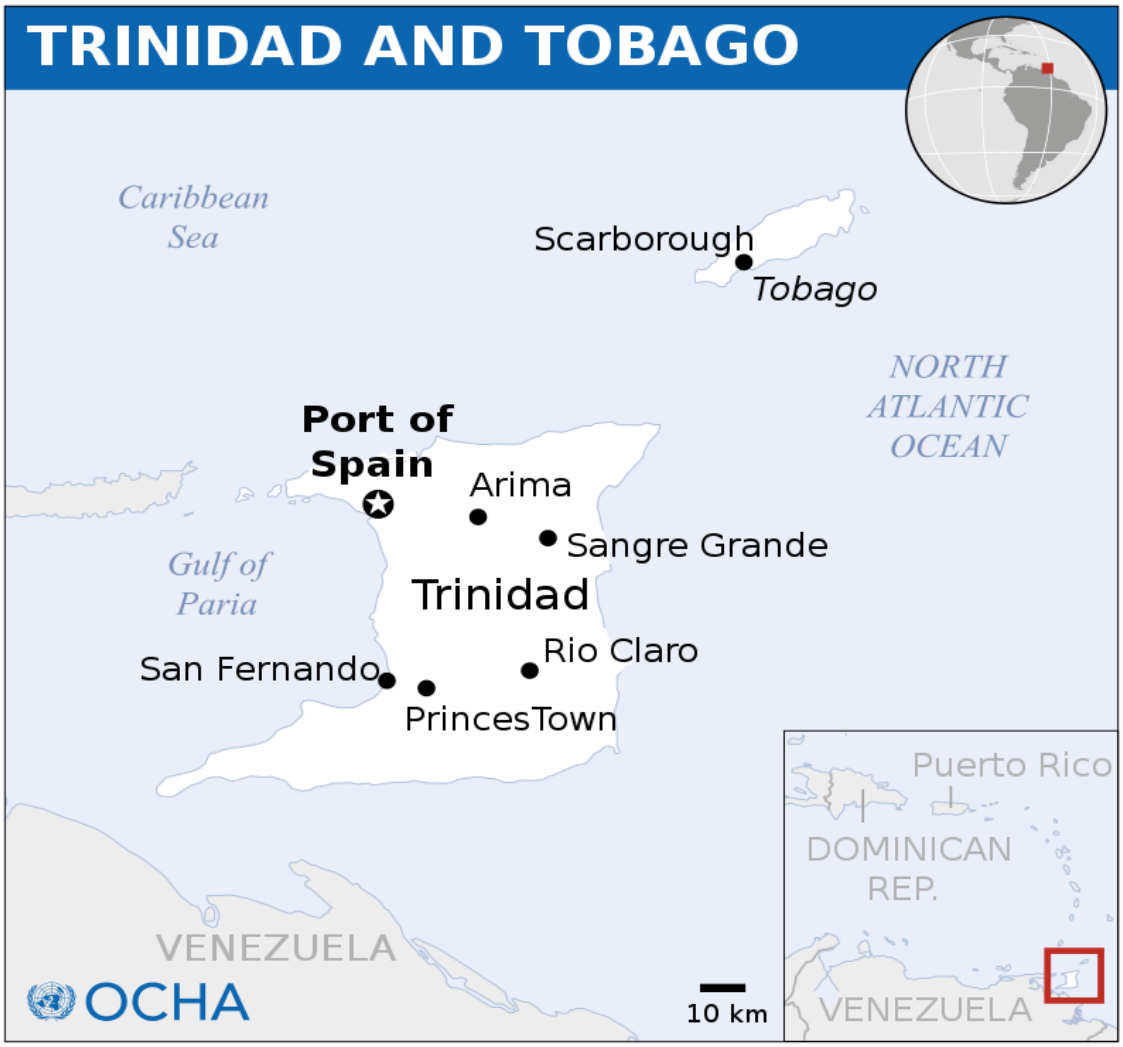

Fig. 1. Map of the Republic of Trinidad Tobago

2.3 Course Adaptations For Online Delivery During The Pandemic's Restrictions

Three major modifications were necessary before the course was delivered virtually.

- The course's practical components are usually conducted on the campuses. These elements included field and container gardening (CG). The COVID-19 restriction protocols imposed in The Republic of Trinidad and Tobago prohibited entry to and gatherings at all learning institutions. Therefore, students were instructed to cultivate their crops at home (home-based gardening) focusing exclusively on CG. Another reason for this approach is the feedback that some students did not have access to enough earthen areas at their residence for the necessary field crop cultivation.

  Prospective teachers were instructed to conduct the following home-based gardening activities:

  1. select and prepare containers for planting
  2. fill the containers with prepared soil
  3. transplant the selected seedlings or sow seeds
     - ✓ a leaf crop – lettuce (*Lactuca sativa*) or pak-choi (*Brasica rapa*)
     - ✓ a fruit crop – ochros (*Abelmoschus esculentus*)
     - ✓ a root crop – radish (*Raphanus sativus*) or beetroot (*Beta vulgaris*)
  4. place the containers in a location where the plants would receive adequate sunlight

- The assessment for the CG was via the University's Canvas platform. Students were required to take photographs of the establishment phase, and thereafter at weekly intervals until harvest [1]. Their results were entered on preformatted reports and uploaded to the Canvas platform for assessment and feedback. A reference, preferably a meter rule, was included in the pictures to allow for identification of any plant changes such as growth, signs of pest and diseases, discolorations, and nutrient deficiencies. Marks were posted weekly along with feedback and appropriate guidance for crop performance.
- The livestock production component is usually assessed via an exhibition where candidates replicate the habitat of chosen Neo-tropical animals with the aim to educate primary school pupils about their indigenous fauna. The term Neo-tropical animals was coined at the VIII International Congress on the Management of Wildlife in Amazonia and Latin America (September, 2008, Acre, Brazil), it was suggested that the term "Neo-tropical Animals" be used for indigenous animal from the Neo-tropics (Central and South America, and the Caribbean) to ensure that these animals were differentiated from wild animals in other regions of the world [14]. The new assessment required students to develop a virtual nature corner of their chosen Neo-tropical animal suitable for the primary schools. These projects were virtually presented as oral assessments.

2.4 DATA ANALYSIS

The qualitative analysis was conducted via SurveyMonkey. In-vivo Coding was used to analyze the open-ended questions and reflections.

3 RESULTS AND DISCUSSION

3.1 PRE-COURSE DATA

Table 1 displays the residency of the respondents in the two electoral districts in Tobago by percentages. Figure 2 shows how the island of Tobago is divided into the electoral districts.

Table 1. Percentage residency of students in the two electoral districts of Tobago

Electoral District	Percentage
Tobago East	66.7
Tobago West	33.3

Fig. 2. Electoral districts in Tobago

Most students (95.2%) completing the survey were females. Literature shows that 59.5 percent of college students in the United States were women in spring 2021 [15]. The University of Florida has a total undergraduate enrollment of 34,931 (fall 2020), with a gender distribution of 43% male students and 57% female students [16]. At The University of the West Indies, St Augustine Campus, Republic of Trinidad and Tobago during the academic years 2015/2016 – 2019/2020 the population comprised 38.15% (6,497) male students versus 61.95% (10,550) female students [17]. Similar trends were observed in higher education institutions in the United Kingdom [18]. Reference [19] stated that 42.5% of university students were male and 57.3% were female. In another study conducted at a state university in Turkey the sampling revealed that 74.07% of the students were female and 25.93% were male [20]. This Global phenomenon at the tertiary level is even more pronounced in education programmes particularly where prospective teachers are trained for the primary schools, this being reflected at the island's Campus. Respondents who did agriculture at the primary and secondary levels were 81% and 52% respectively. These students were offered the subject at various class levels (Table 2).

Table 2. Classes where students were offered agriculture

Class	Percentage
Infants	33.3
Junior Primary (Standards, 1-3)	81
Upper Primary (Standards, 4-5)	42.9
CSEC (Forms 1-3)	61
CSEC (Forms 4-5)	33.3
CAPE	0
ECIAF certificate	0

These results suggest that agriculture is viewed as a second interest subject, particularly at the primary level, where it is not tested in the Secondary Entrance Assessment (SEA) for secondary school placements [1]. Therefore, the traditional Mathematics and Language Arts take precedence, especially at standards 4 and 5 where preparations for SEA are the focus.

Crops were the most familiar area of agriculture to the survey target group (Table 3). Children 4 to 10 years were better able to name animals than plants [21]. However, this may change with age as life experiences increase their awareness of the vegetative environment. Therefore, the responses of the student teachers were possibly reflections of their environmental experience. Participants (69.9%) also indicated their inefficient understanding of the crop sector (Table 4) and 46% (Table 5) stated they would ask questions about crops to increase their knowledge. The high interest in crops would be influenced by the primary and secondary schools where practical agricultural exercises center on plants rather than animals. Crop interest included sowing seeds, pest and disease control, fertilizer and manure application and effects, irrigation, harvesting and container gardens.

Apart from aquaculture no knowledge of animals was indicated. This fish specificity may be a result of living on the island of Tobago (300km2), where relationships between sea water, live fishes, harvested fishes, and fish consumption are daily occurrences for many natives to the sunshine paradise. There may be a lack of interest in animals among the surveyed group as only 2% (Table 5) listed questions on animal production. Although some primary schools in Tobago have animals, most school farms/gardens activities focus on crops. Students also expressed that the business of agriculture was important to them, indicated by their interest in knowing about agriculture economics (Table 5). Technology enquiries were mainly direct to reducing labour/workload in agriculture through the application of technologies.

Table 3. areas students knew about agriculture

Areas students knew about agriculture	Percentage
Aquaculture	1.89
Economics	7.55
Crops	54.72
Forestry	1.89
Provide food	3.77
Provide products	1.89
Provide employment	1.89

Table 4. List of things students wanted to know about agriculture

Things students listed they need to know about agriculture	Percentage
Crop production	69.90
Soils	6.35
Economics	11.11
Climate change	1.59
Processing	1.59
Food security	1.59
Rearing animals	11.11
Fisheries	3.17
Motivation for agriculture	1.59

Table 5. Students' responses to questions they would ask about agriculture

Category	Percentage
Soil related	6
Agriculture education	14
Agriculture economics	22
Agriculture sustainability	2
Technology in agriculture	8
Crop production	46
Animal production	2

Approximately nine tenths (90.5%) of the respondents thought that CG was a viable option for teaching practical agriculture during the Pandemic' restriction periods. During these periods (2020 - 2021) teaching institutions were challenged to complete courses. There were further struggles to accomplish practical components and innovative approaches were necessary [22], particularly for subjects such as agriculture. Therefore, the procedure to combine the home-base practical, and the online assessment and feedback may be an adequate alternative to Campus-based agriculture practical during a Pandemic or other situations where environmental restrictions on movement are imposed.

When asked to rate (0-5, 5 being the highest) their confidence level for using CG, 90.5% of the students indicated levels between 3 and 5. Reference [23] reported that CG was used by children (grades 1–6) to produce vegetables ultimately increased their consumption of these glow foods. Therefore, the Tobago prospective students may have recognized the importance of CG as a resource-saving method for agriculture educational-strategies in the primary schools on the island and would share this to their pupils as practicing teachers.

Over 50% of the student teachers were able to identify four of the five indigenous wildlife species listed (Figure 3), namely agouti (*Dasyprocta leporina*), Scarlet Ibis (*Eudocimus ruber*), Red brocket deer (*Mazama americana*), blue crab (*Cardisoma guanhumi*), the cocrico (*Ortalis ruficauda*).

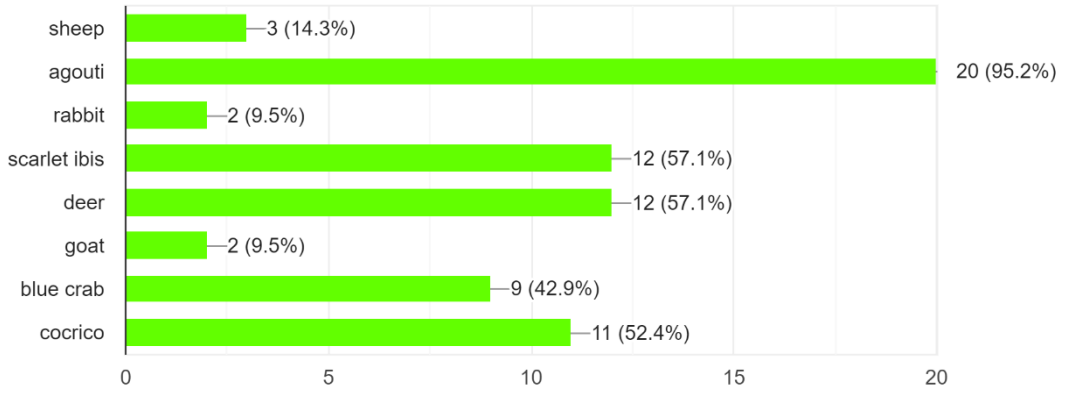

Fig. 3. Identification of indigenous wildlife

Two hundred and fifteen pre-service primary teachers in Portugal and Spain more accurately identified indigenous animals in photographs from the African Savannah than those from the Iberian Peninsula [24]. These authors concluded that it was important to promote an environmentalist approach to local fauna to improve the regional biodiversity. Unfortunately, there is evidence that the exposure of children within schools to 'real' animals has been declining for many years [25]. Earlier studies by [26] and [27] showed that students did poorly at identifying the indigenous fauna of Brazil. In Switzerland six graders correctly identified 51.2 % of the native animals [28], and similar trends were reported by [29]. The literature would suggest that the Tobago Prospective Teachers have acquired a fair knowledge of their indigenous wildlife during earlier schooling and life experiences. This places them in a progressive position for further learning with local fauna through the agricultural teacher training at UTT. Such an approach may fill any gaps in their knowledge of native animals. UTT has changed the teacher training agricultural courses to include the uses of indigenous wildlife and its integration in the primary schools.

Interest in animals increased with age up to 9 in the UK [30], and up to 14 years in Germany [31], decreasing subsequently. The island's primary schools' prospective teachers possibly had some exposure to Tobago's fauna. In addition, literature shows that in West Africa the inclusion of western education into their Early Childhood Education generated a fragile gap between the generation's indigenous knowledge and the western education. To strengthen the bridge, it was recommended such western curricula must be developed with the participation of indigenous knowledge for Early Childhood Teacher Training. The authors included indigenous animal exposure in their descriptions of indigenous knowledge [32]. Further, 90.5% of the candidates surveyed indicated that indigenous wildlife should be included in Agriculture Science at the primary schools. Therefore, this important learning experience will position the Tobago prospective teachers to transfer key skills to future contributors for the tropical paradise's sustainability and self–sufficient growth.

Conventional and didactic filmmakers focus more on amazing exotic animals and their endangered environments [33]. Therefore, children's learning experiences for wildlife does not home in on their indigenous species. Over ninety percent (90.5%) of the surveyed student teachers enumerated that indigenous wildlife should be used as teaching resources for other subjects at the primary schools. Thus, highlighting the urgency of the lack of learning in this area and the hunger for indigenous knowledge. Reference [34] also indicated that indigenous knowledge provides a valuable resource for sustainable development.

Students were asked to select which benefits, other than academic, they thought would be derived from having indigenous wildlife at the primary school, Figure 4 lists these results.

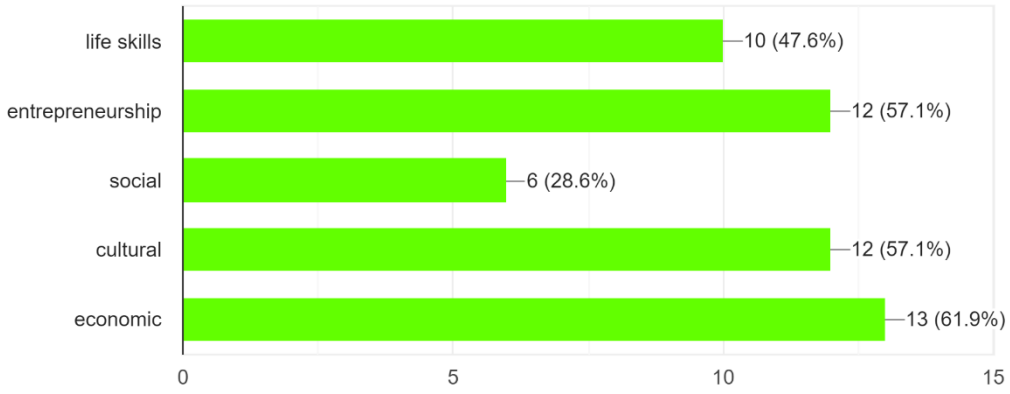

Fig. 4. Academic benefits of indigenous wildlife in the primary schools

Over 55% of the respondents listed both economics and entrepreneurship as benefits of having indigenous animals as resources in primary schools. While 46.7% indicated the development of life-skills, 57.1% cultural appreciation and 28.6% other social gains. Reference [35] listed numerous socio-economic benefits including cultural and spiritual, social, economic, environmental and capacity building benefits of indigenous wildlife engagement in Aboriginal communities in Australia.

3.2 POST-COURSE DATA

It was observed that 78.57% of the prospective teachers indicated that CG impressed them most and contributed to their overall course experience. While 57.14% stated that the approach to the course changed their attitude towards agriculture and their thought processes were more positive about the subject. Over 46% of the students decided that Neo-tropical animals should be included in the primary school curriculum (Table 6). Nevertheless, crops were favoured over livestock. Self-sufficiency in animal protein is an integral part of a nation's nutritional programme ([36], [37]). It is important to ensure necessary training at all levels, including the preparation of pre-service teachers to deliver the agricultural practical and theoretical content to the primary schools, therefore providing the learning experiences which may influence further agricultural professionals (farmers, processors, educators, policy makers etc.). The disparity between favouring crops over animals identified in the pre and post course data collections may be equated by integrating the Neo-tropical animal component in the CG element.

Table 6. Reflection of prospective teachers' course experiences and impressions during the semester

Responses	Percentage
Only did agricultural theory	7.14
Initially intimidated about AGSC3018 practical & online	21.43
Container Garden	78.57
1st impression of AGSC3018 was challenging	17.86
Became routine after 2-3 weeks	7.14
Business aspect of farming	28.57
Attitudes toward agriculture changed	57.14
Thematic approach interesting	32.14
Neo-tropical animals included in curriculum	46.43
Recycling	3.57
Affective objective of this course was met	3.57
Started home garden	3.57
Group work	7.14
Demonstration lessons	14.29

Course participants also revealed they found the practical work challenging at first (17.28%) but it became routine after 2 to 3 weeks (7.14%). Although the upload of the Preformatted Reports proved an adequate method of assessment for the CG

practical, there is room for improving the combination of the individual home-based practical aspect of agriculture and online assessments. Therefore, more research in these areas are necessary. Authors of references [38] indicated that technology can offer innovation and significant integration for education. Digital Assessment (DA) for these practical reports should be such a pioneering assessment. However, connections of practical instructions, student participation and a DA platform/app are subjects for further research. Such development would allow university courses with heavy practical components to be delivered online and assessed via the technological platforms/apps.

Practical courses/activities are important at the university level [39], and at the societal level. They lead to the drafting and implementation of policies that can help the development of agriculture and enthusiasm for healthy and sustainable environments, and food security [40]. Practical activities stimulate students' interest in the teaching-learning procedure and are therefore vital pedagogical instruments in education, particularly for science and practical-based courses [41]. The need for blending/integrating theoretical and practical knowledge were also emphasized by other authors [6]. These synergies must be designed and implemented in the shortest possible time frame for agriculture education in B.Ed. programmes to continue unabated through the occurrences which challenge face-to-face teaching and learning. Such instances may increase the efforts for online learning. However, the question is "Can the delivery of practical-based agriculture teacher-education courses be more economical/feasible and learner fulfilling than the equivalent in face-to-face mode?". More research is needed in this area and the development of accompanying technologies.

Seventy-five percent of the respondents stated that as educators they would use CG in their teaching (Table 7). In the Pre-course Survey 90.5% of the candidates thought the CG was a viable option for teaching the practical aspect of crop cultivation during the COVID-19 pandemic's restrictions. This philosophy may also apply to other situations where face-to-face teaching and learning is difficult and the virtual classroom is a viable option. Seventy-five percent of the respondents were willing to include CG in their teaching. Therefore, CG should be the focus point for inclusion of other important areas of the agricultural teacher training such as Farm Business and Neo-tropical animals. In the pre-course data collection students indicated that knowledge of fauna and flora are important aspects of agricultural education for the preparation of teachers.

As students' need for integrating the CG into the curriculum increased, so did their desire for integrating Neo-tropical animals into the curriculum (<0.05). In the pre-course data collection 78.57% of the prospective teachers indicated that the CG element of the course impressed them the most and 46% of the students decided that Neo-tropical animals should be included in the primary school curriculum. It has been found that the European approach to organizing vocational training of future agricultural specialists is a multi-aspect and strives to fulfill educational needs of the majority of learners, namely, through practical agricultural training, basic agricultural training and full-time agricultural training [42]. The dissatisfaction amongst preservice teachers with the way agricultural courses were taught was described by previous authors [43]. Major contentions were courses' content quality, quantity, and transferability. They recommended developing assignments that promote the students' understanding of the content delivered.

Table 7. Concepts prospective teachers chose to include in their teaching

Responses	Percentage
Student to use Container Gardening	75
Business of farming	7.14
Thematic method in teaching to integrate curriculum	35.71
Teach importance of recycling through CG	3.57
Use agriculture to encourage healthy lifestyle in students	7.14
Demonstration lesson	10.71
Use Neo-tropical animals	7.14
Also encourage students to plant at home	32.14

4 CONCLUSION

The University of Trinidad and Tobago (UTT) container garden approach was successfully used for continuity of agricultural practical training during the pandemic for the institution's prospective teachers in the Republic of Trinidad and Tobago. This will assist in minimizing the disruption of garden activities and the delivery of vital concepts through hands-on involvement where restrictions are imposed on face-to-face teaching and learning.

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APPENDIX 1

Dear Students Welcome to our course AGSC3018 Agriculture in the Primary Schools Tobago class. We would like you to fill this form out for us so we can understand your present knowledge of Agriculture.

1. **Enter your UTT Student's ID #**

2. **In which of the Electoral Districts do you live?** East West

3. **Gender** Female / Male

4. **Religion** Christianity / Hinduism / Islam / Judaism / Rastafarianism / Other

5. **The primary school I attended was located in the Electoral District of:**

6. **Did you do Agriculture at the primary school?** Yes / No

7. **What classes offered agriculture?** Infant Class / Junior (Std. 1-3) / Upper (Std. 4-5)

8. **The secondary school I attended was located in the Electoral District of:**

9. **Did you do agriculture in secondary school or another institute?** Yes / No

10. **At what level was this done (you can select more than one)**
    Lower Secondary level (forms 1-3)
    NEC Level (Forms 4-5 craft level) 2
    CSEC level (Forms 4-5 CXC O' level)
    Cape
    ECIAF certificate
    Other: _____

11. **Are your parents involved in agriculture?** Yes / No

12. **If yes to 10, which of these**
    Vendor / Farmer / Processor / Agri Education
    Other, please specify _____

13. **List 3 areas you know about Agriculture**

14. **LIST 3 things you need to know about agriculture**

15. **LIST 3 questions you need answered about agriculture**

16. **Do you think that Container Gardening (growing plants in pots at home) is a viable option for teaching practical agriculture during the Pandemic's restrictions?**
    Yes / No

17. **Rate your confidence for using Container Gardening as suggested in previous question (16.).**
    0 1 2 3 4 5

18. **Can you select the indigenous wildlife from the list below: (you can select more than one answer)**
    Sheep / Agouti / Rabbit / Scarlet Ibis / Deer /Goat

19. **Do you think indigenous wildlife should be included in Agricultural Science at the primary school level?**
    Yes / No

20. **Do you think indigenous wildlife would be used as teaching resources for other subjects at the primary school level?**
    Yes / No

21. **Apart from the academic benefits of involving indigenous wildlife at the primary school level select any other benefits you think appropriate from the list below.**
    Live Skills
    Entrepreneurship
    Social-Cultural
    Economic

Other: _____