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21ST Century Skills Required in Eswatini's Higher Agricultural Education Curriculum

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The skills gap between agricultural education graduates from the University of Eswatini (UNESWA) and what employers are searching for is growing. Literature informs that this is mostly due to the world's rapid changes, with ICT serving as the primary change engine, necessitating new sets of sills from graduates as well as up-to-date teaching and evaluation methodologies in higher education institutions. These demands prompted the researchers to first establish the set of 21st century skills that UNESWA graduates must acquire in order to thrive and participate fully in today's market. The study's purpose, therefore, was to develop a set of 21st century skills that could be incorporated into UNESWA's agriculture higher agricultural education curriculum. Phase I used a two-round modified Delphi technique to investigate the concept dimension and sub-dimensions of 21st century skills with agricultural education specialists in Eswatini. Phase II employed a survey to triangulate the prior data collection method, population used, and findings by using secondary agriculture teachers in Eswatini to establish the 21st century skill gaps (Round 2) and the highly ranked 21st century skills. Future agriculture education graduates in Eswatini, according to the findings, need to learn 35 particular 21st century skills in order to excel in today's profession and life. These include, but are not limited to, creativity, networking, self-efficacy, problem solving, and digital literacy.. Therefore, it is recommended that the University of Eswatini incorporate these skills into the higher agricultural education curriculum and be intentional in developing them in Eswatini's future agricultural education graduates. As a result, lecturers from the Department of Agricultural Education and Extension would need training on how to effectively teach and assess these abilities in their prospective graduates.

Keywords: agricultural higher education curriculum, Eswatini, Modified Delphi Technique, 21st century skills.

Introduction

The entire world has witnessed a period of rapid change since the start of the 21st century, whether it is in society, technology, trade, or economics on a global scale (Care, Kim, Vista & Anderson, 2018). Challenges such as shifting work patterns, an explosion in information access and use, poverty, the digital divide, environmental degradation, diseases, illiteracy, and changes in family and community dynamics have recently been brought on by the COVID-19 pandemic, making lifestyle changes more inevitable. Naturally, in such circumstances, a fresh set of skills, referred to as the 21st century skills would be needed to help people deal with and overcome these real-life obstacles (Kennedy & Sundberg, 2020).

This was supported by Bellanca and Brandt (2010) and Greenstein (2012), who stated that the development of 21st century skills in every person is now more urgent due to the advancement of technology, the rapidly changing workplace, an increasingly diverse workforce, and the fiercely competitive global economy. Chalkiadaki (2018) defined 21st century skills as the knowledge, skills and attitudes necessary to be competitive in the 21st century workforce, participate appropriately in an increasingly diverse society, use new technologies and cope with rapidly changing workplaces. In the Kingdom of Eswatini, the Curriculum Framework Document of Eswatini (2018) postulated 21st century skills as a set of skills needed by every individual in the country to survive and develop in a knowledge-based society. Employers today value soft skills more than technical abilities, which are the primary focus of university curriculum development (Kennely, 2015). A cross-institutional assessment conducted by Michigan State University in partnership with the Association of Public and Land-grant Universities (APLU) and the University Industry Consortium corroborated this finding. The survey focused on important soft skills needed for successful transition from completion of baccalaureate degrees to competitive employment in agriculture, natural resources and related careers. Findings revealed that employers and alumni today value soft skills more than disciplinary knowledge. Communication, decision-making, problem-solving skills, and teamwork were ranked highly and found to be particularly important (Crawford et al., 2011). As the World Economic Forum (2019) stated, the world is approaching a fourth industrial revolution that will drastically change the way people live, work, and interact with one another, made possible by unprecedented technological breakthroughs amongst other things. As a result, a great demand came for individuals to be upskilled and reskilled as their professions increasingly entail the usage of disruptive technology.

Legal Frameworks Supporting Development of 21st Century Skills in Education. Numerous 21st Century Skills Frameworks exist and have been discussed in the literature. Among the many are: the *"21st Century Skills and Competences for New Millennium Learners in OECD Countries"* by the Organization for Economic Co-operation and Development (OECD, 2005); the *"Framework for 21st Century Learning"* by Partnership for 21st Century Skills (2019) and the *"Key Competences for Lifelong Learning"* by the European Parliament and the Council of the European Union, developed in 2010 (Care et al., 2018). Similarities are observed in these frameworks, because they all emphasize the need for higher-order thinking and innovation skills, interdisciplinary learning, integration of ICT into the curriculum, and life skills that prepare the young for global competition (Binkley et al., 2012). Proponents of the different frameworks support the promotion of 21st century skills in educational settings since students need to master not only knowledge, but also the abilities to interpret, apply, and create knowledge in a digital and fast-changing world. This has led to the adoption of these popular frameworks by many countries around the globe because of their broader application. In an in-depth analysis conducted by Voogt and Roblin (2012), the 21st century skills common in all frameworks, and regarded as important competencies in the 21st century include amongst others collaboration, communication, ICT literacy, social and/or cultural skills and citizenship, creativity, critical thinking, problem-solving, productivity, learning to learn, and more.

A thorough critique of these frameworks, however, revealed an inability of the listed skills in the frameworks to perfectly suit different geographical context and education fields

and/or disciplines (Rose, 2009). Instead, most of these frameworks list 21st century skills that focus on what businesses need for workplace productivity, and omit personal goals or robust goals for cultural understanding (Rose, 2009). As a result, many who articulate 21st century skills are from business and industry and therefore propose frameworks that primarily support skills emphasizing efficiency and economic returns. In addition, explicit references of the 21st century skills to a level of education, either primary, secondary, vocational, or higher education, or an educational environment, either formal or informal are often missing in the descriptions provided. Prioritization of skills in any area cannot be overemphasized because most of these 21st century skills identified in the different frameworks have different focus areas, hence, there is a variation in their perceived importance in each field, discipline, or area of specialization (Fisher & Thijs, 2015).

Higher Agricultural Education Curriculum and 21st Century Skills in Eswatini. In the Kingdom of Eswatini, agricultural education remains a vital part of its education for agricultural development in the country (Government of the Kingdom of Swaziland, Educational Sector Policy, 2018). As a school subject, it plays an important role in shaping attitudes and developing knowledge and skills that contribute to the development of the agriculture industry. As a result, agricultural education is key to developing the school learners' awareness, knowledge and skills for the agricultural workforce and productivity. Since 21st century skills have become increasingly important for students to possess in today's world, school-based agricultural education teachers must also customize their teaching to prepare students to enter the workforce directly after high school or post-secondary education (Schneider, 2016). This expectation translates to a higher agricultural education program that will prepare future graduates with the required 21st century skills through their curriculum (Government of the Kingdom of Swaziland - NETIP, 2018). Agricultural education instructors, therefore, need to know the specific 21st century skills required by students in the discipline as well as tools to help them assess and improve their curriculum. No education can rise above the quality of its teachers and whatever the young generation becomes will be the direct outcome of whatever the teacher has inculcated in them (Simelane, 2017). A discrepancy exists between the skills that employers' value and those that agricultural education graduates demonstrate. This was echoed by the Senior Inspector of the Agriculture subject, during a collaborative meeting of Agricultural Education stakeholders in the country held at the University of Eswatini, Luyengo campus, in which the authors also attended. Even worse, the UNESWA agricultural education curriculum simply lists the courses included in each program and the length of the program (UNESWA Calendar, 2020/2021). Glaringly missing is the fact that the curriculum makes no mention of any inclusion of 21st century skills crucial to the discipline, either as separate courses or as a component of the existing courses. Therefore, efforts are needed to give future agriculture education graduates a clear direction and focus on the collection of 21st century skills that are crucial for their development. Hence, by identifying a set of 21st century skills tailored for a higher agricultural education curriculum in Eswatini, the study will fill that knowledge gap. As a result, the study's purpose was to identify the 21st century skills needed for the curriculum of higher agricultural education in Eswatini. Findings from the study will be beneficial to UNESWA agricultural education department. Educators will have empirical evidence on the important 21st century skills set to be acquired by them in order to impart the same to their students. This will lead to the training of the educators who will then have

deeper understanding on how a revised higher agricultural education curriculum might look like catering for the demands of the employer and the workplace.

Theoretical Framework

The Partnership for 21st Century Learning's Framework for 21st Century Learning presented in Figure 1 serves as the foundation for this study (2019). This framework is pertinent to the study because it outlines the abilities, know-how, and expertise that students must possess to excel in school and in life. Every 21st century skill implementation, according to the Framework, requires students to gain a firm grasp of fundamental academic subject matter. The framework is combined with the essential support systems, such as standards, curriculum and instruction, assessments, professional development, and learning environments. When an educational program is built around this foundation, graduates will have the abilities necessary to succeed in the modern global economy and will be able to teach those same skills to their students.

Figure 1

P21's Frameworks for 21st Century Learning by Battelle for Kids (2019)

Methodology

The study took a pragmatic philosophical approach, using a mixed-methods research approach with two phases: Phase I, an exploratory stage, and Phase II, a survey. Hence, triangulation was used in the research design, data sources, data collection, instruments used, and data analysis. Phase I used a two- round modified Delphi Technique where agricultural education experts were used and requested to indicate to retain or not each skill in Round 1 and rank the retained skills in Round 2 with reference to what skills graduates in agricultural education in Eswatini should possess. The target population for Phase I was all agricultural education experts in Eswatini (N=20) consisting of three Agricultural Education lecturers at

UNESWA, three lecturers at William Pitcher College, two lecturers at Ngwane Teachers College, six Agriculture Inspectors, five representatives from the National Curriculum Centre and one agriculture examination moderator. Experts in 21st century skills are still wanting in Eswatini, however, due to the plethora of work that exists in literature on the concept, such work were availed to experts, and based on their knowledge and expertise in agricultural education, were able to react to the concept items, prioritizing those important and specific to the agricultural education in Eswatini. Census sampling was conducted, since the size of the group was manageable.

A questionnaire titled: *Higher Agricultural Education Curriculum Century Skills Questionnaire* (HAECCSQ version 1, 2 and 3) was developed and used for data collection in the study. Round 1 questionnaire (HAECCSQ 1) sourced the concept dimensions and sub-dimensions or items from the framework used for this study and additional relevant literature. The sub-dimensions included both open- and close-ended questions. Round 2 questionnaire (HAECCSQ 2) was developed from the findings of the previous round. In the development of Round 1 instrument (HAECCSQ 1), one (1) section was constructed. In this section, participants were requested to rate the priority level of each of the 21st century constructs using a 5-point rating scale from: Very Low Priority (1) to Very High Priority (5). Participants also provided additional comments and any other suggestions for the 21st century skills needed to be developed in future agricultural education graduates in Eswatini. Not all sub-dimensions in Round 1 were retained in Round 2, as only those that achieved consensus were retained. A consensus rate of 80% (summative of high priority and very high priority) for each sub-dimension in the questionnaire was set *a priori* in this study. An 80% consensus rate was set for this study, since it intended to include highly prioritized skills by most (80%) agricultural education experts, eliminating the inclusion of mediocre skills (<80%) into the curriculum. The consensus criteria used in this study are shown in Table 1.

Table 1

Consensus Criteria for Rated Sub-dimensions and Meanings Given

Consensus Criteria on the 5-point rating scale (*set a priori)**	**Decision**
Highly Essential if: ≥80% 4-5, IQR ≤1 and Median ≥4	*Endorsed = Banked*
Desirable if: 50%-79% 4-5, IQR >1, but < 2 and Median either ≥4 or <4	*Retained for inclusion in Round 2 questionnaire*
Not Essential if: ≤50% 4-5, IQR ≥2 and Median <4	*Rejected = Dropped*

*Developed by Authors

Round 2 questionnaire provided an outline of the results of the previous round; showing participants' own individual ratings as well as the pooled ratings of the group. Therefore, the results presented the agreement level, interquartile range, and the median score. The aim of the second round was to evaluate and re-evaluate ideas and develop consensus among expert members. The Round 2 questionnaire (HAECCSQ 1) consisted of two (2) Sections, Section A and B. Sections A sought similar information as in Round 1, whilst additional Section B requested for background and demographic characteristics of the

participants. Participants in this round were given the opportunity to see how the rest of the group prioritised skills in the section and see if they wanted to change their opinion on the basis of the group consensus. They were also provided with a space at the end of the section encouraging them to add comments on any changes made, if any. Additional sub-dimensions suggested in Round 1 were included in the instrument and respondents were asked to rate their priority levels as in Round 1 on the same 5-point rating scale.

Data were analysed using the criteria presented in Table 2 and only sub-dimensions that met the "Highly Essential" criteria were considered. Stability of opinions between the two (2) rounds was achieved as 15% change level between the two rounds was noted. A fifteen (15%) change level is deemed appropriate cut-off point of the opinion stability between two (2) successive rounds (Scheibe et al., 1975). The sub-dimensions from this phase were further used to develop a survey instrument for Phase II (HAECCSQ 3) of the study. The trustworthiness of findings in terms of credibility, dependability, transferability, and confirmability were ensured for the data. Validity and reliability of the instrument were also ensured for the quantitative aspect of the questionnaires for the two rounds. The validity of instrument HAECCSQ 1 and HAECCSQ 2 was also depended on the fact that the Delphi is built on the notion of safety in numbers, which means that a group of individuals is less likely to make a bad judgment than a single person. Decisions are then enhanced through reasoned debate in the form of iterative rounds in which assumptions were challenged, aiding in the enhancement of validity (Hill & Fowles, 1975). Reliability for instruments HAECCSQ 1 and HAECCSQ 2 was dependent, also on the nature of the Delphi technique. This is because in the decision-making process, the members of the expert panel do not meet face to face, which eliminates group bias or group thinking (Keeney, Hasson & McKenna, 2011). The panel size and iterative rounds also increases the reliability. Lastly, because the reliability procedures looked at the stability in measurement over time or across forms, it was not compulsory to establish it in subsequent questionnaires as the use of the modified Delphi technique encourages experts to modify their responses toward reaching group consensus (Shariff, 2015). Therefore, pre-testing was not conducted with HAECCSQ1 and HAECCSQ 2 in the study.

Qualitative Round 1 data were analysed using thematic analysis. Thematic analysis has been defined as a more qualitative approach that advocates for a flexible coding and theme development (Terry et al., 2015). Thematic analysis in the study used a six-phase analytic process that included familiarizing with the data, generating codes, generating for themes, assessing potential themes, defining and labelling themes, and producing a report. The quantitative Round 1 and Round 2 data, however, were analysed using descriptive statistics such as percentages, inter-quartile range and median.

Phase II of the study was the survey. Its target population was 404 high school agriculture teachers of Eswatini. The simple random sampling technique using lottery method was used to select respondents from the sampling frame. The statistical formula suggested by Dillman (2000) was used to determine the required representative sample size (n=198). HAECCSQ 3 was developed from Phase I findings of the study to collect data. It was divided into two sections. Section 1 solicited the background and demographic characteristics of respondents. Section 2 provided a list of 21st century skills that panel of experts in agricultural education agreed on in Phase I of the study and requested respondents to rate their importance level on a 5-point numerical scale from Very Low Importance (1) to Very Important (5). Content and face validity was established by agricultural education experts from Nigeria who were given the purpose of the study. The questionnaire was also tested for

reliability through pilot testing on 30 secondary school agriculture teachers in the country, who were disqualified during sampling. The reliability coefficient of the HAECCSQ 3 was r=0.88 as shown in Table 3. This indicated that the instrument was reliable (Van Teijlingen & Hundley, 2002). The reliability coefficients for the dependent and independent variables dimensions in HAECCSQ 3 are displayed in Table 2.

Table 2
Reliability Coefficient for Dependent and Independent Variables Dimensions in HAECCSQ 3

Dimension Rating of:	**Number of Items**	**Cronbach Alpha (*r*)**
21st Century Skills for Higher Agricultural Education Curriculum	39	0.82
Objectives of Higher Agricultural Education Curriculum	17	0.87
Curriculum Contents Needed by Agricultural Education Graduates	19	0.91
Teaching Approaches Appropriate for Curriculum Contents	22	0.92
Teaching Methods to be Used in Higher Agricultural Education Curriculum	38	0.84
Teaching Strategies to be Used in Higher Agricultural Education Curriculum	20	0.92
Assessment Methods to be Used in Higher Agricultural Education Curriculum	22	0.91
Overall	**177**	**0.88**

Data in Phase II were analyzed using descriptive statistics of frequencies, percentages and measures of central tendency (means and standard deviations).

Findings

Background and Demographic Information of Participants and Respondents. Gender, age, marital status, highest degree, work experience, occupation, and position held at work were the background and demographic variables of respondents in the study as shown in Table 1. Participants (agricultural education experts) in Phase I (two-round modified Delphi technique) were seventeen (N=17), while respondents in Phase II were one hundred and ninety eight (n=198) agriculture teachers. Data from the demographic factors were analysed using frequencies and percentages. Males outnumbered females in both the two-round modified Delphi technique and the survey phase of this study, with twelve (70.6%) and one-hundred and fourteen (58%) involved in Phase I and Phase II, respectively. In Phase I,

five females (29.4%) were recorded, and eighty-four (42%) participated in Phase II. Among these, eighty-eight (47.1%) participants in Phase I were mostly over 40 years old, making them older than respondents in Phase II, who were mostly between the ages of 36 and 40 (33.3%). In the two-round modified Delphi technique, eight fell within the age bracket of 40 to 49 years (47.1%), another eight were within the age bracket of 50 to 59 years (47.1), and one was in the 30 to 39 years (5.9%).Additionally, 1.8% were between the ages of 21 and 25, 14.6% were between the ages of 26 and 30, 29.3% were between the ages of 31 and 35, 33.3% were between the ages of 36 and 40, and 21.2% were over the age of 41, in the survey. The majority of the study's participants and respondents were married. In Phase I, fifteen (88.2%)) were married (and two (2) were single (11.8%). In Phase II, one hundred and twelve (57%) were married (, seventy-six were single (38%), and ten (5%) were divorced. Findings also revealed that all participants in Phase I had a postgraduate degree, whereas respondents in Phase II mostly (83.8%) had an Undergraduate degree. This is demonstrated by the fact that thirteen (n=13, 76.5%) had a Master's Degree in Agricultural Education and four people (n=4, 23.5%) had a PhD in Agricultural Education in Phase I of the study. In Phase II, 122 respondents (82.8%) had a Bachelor's Degree in Agricultural Education and 32 (16.2%) had a Master's Degree in Agricultural Education. Only two (2) (1%) reported having a Diploma in Agricultural Education.

Experts who participated in Phase I of the study were mostly educators (n= 12, 70.6%), three curriculum designers and/or evaluators (17.6%), and only two inspectorates (11.8%). Participants in Phase II of the study were all (n= 198, 100%). secondary agriculture teachers. Amongst the participants in Phase I of the study were five (23.5%) lecturers, four (29.4%) senior lecturers, three (17.6%) Heads of Departments, one (5.9%) principal of a vocational institution, one (5.9%) Senior Inspector, one (5.9%) inspector, and two (11.8%) curriculum designers/evaluators. The Phase II of the study involved teachers one hundred and forty-eight (96%) and fifty (4%) heads of department. In terms of work experience, the majority of experts (52.9%) had work experience between 21 and 30 years, yet most respondents (60.1%) who participated in Phase II (survey) of the study had work experience of between 1 -10 years. This is evident in Phase I, which reveals that nine (52.9%) 17 had work experience ranging from 21 to 30 years, six had work experience of 11 to 20 years (35.3%), one had work experience of 1 to 10 years (5.9%), and one other had work experience of 31 to 40 years (5.9%). Among the teachers in Phase II, however, 119 (60.1%) had less than 10 years of experience, and 69 (34.8%) had between 11 and 20 years of experience. In order to thoroughly address the research problem at the interpretation level, data from Phase I of the study were linked with data from Phase II of the study using a joint display as shown in Table 3. A joint display enables the visual presentation of data in order to "draw new insights beyond the information gained from the separate quantitative and qualitative results" (Fetters et al., 2013).

Table 3

Joint Display Comparison of Background and Demographic Data from Phase I (two- rounds modified Delphi Technique) and Phase II (Survey)

Variable	**Delphi (N=17)**	***F***	**P (%)**	**Survey (n=198)**	***F***	**P (%)**
i. Gender	Males	12	71	Males	114	58
	Females	5	29	Females	84	42

Variable	Delphi (N=17)	*F*	P (%)	Survey (n=198)	*F*	P (%)
ii. Age	30 -39 years	1	5.9	21 – 35 years	3	1.5
	40 – 49 years	8	47.1	26 – 30 years	29	14.6
	50 – 59 years	8	47.1	31- 35 years	58	29.3
				36 – 40 years	66	33.3
				41 years and above	42	21.2
iii. Marital status	Single	2	12	Single	76	38
	Married	15	88	Married	112	112
	Divorced	0	0	Divorced	1	10
iv. Educational qualification	Master's	13	76.5	Bachelors'	162	82.8
	PhD	4	23.5	Master's	32	16.2
				Other (Diploma)	2	1
v. Occupation	Educators	12	70.6	All Teachers	198	100
	C. Des/Eval.	3	17.6			
	Inspectorate	2	11.8			
vi. Position held at work	Lecturer	5	23.5	Teacher	148	96
	S. Lecturer	4	29.4	HOD	50	4
	HOD	3	17.6			
	C. Des/Eval.	2	11.8			
	Principal	1	5.9			
	Senior Inspector	1	5.9			
	Inspector	1	5.9			
vii. Work Experience	≤10 years		5.9	≤10 years	119	60.1
	11 – 20 years		35.3	11 – 20 years	69	34.8
	21 – 30 years		52.9	21 – 30 years	9	4.5
	31 – 40 years		5.9	31 – 40 years	1	5

Findings - Two-rounds Modified Delphi Technique (Phase I). A two-round modified Delphi technique was conducted to delineate the 21st century skills to be included in Eswatini's higher agricultural education curriculum. Presented are findings from Phase I (Round 1 and Round II of Delphi technique) and later Phase II (Survey).

Round I Findings - Modified Delphi Technique: Round I questionnaire (HAECCSQ 1) had thirty (30) sub-dimensions (items) on 21st century skills derived from the study framework and a thorough review of literature. These were categorized into three (3) groups, namely: (i). *Life and Career Skills; (ii). Learning and Innovative Skills; and (iii). Information, Media and Technology Skills*. Participants were asked to indicate on a numeral scale of 1 (*Very Low Priority*) to 5 (*Very High Priority*) those skills that they thought could be prioritized in the training of future agricultural education teachers in Eswatini. Measures of central tendency (*percentage, interquartile range* and *median)* were used to analyze quantitative data and *thematic analysis* was used to analyse qualitative data. A consensus level of 80% and above was set *a priori*. Items that fell within the ≥80% Consensus Rate with

≤1 Interquartile Range and ≥ 4 Median score were considered of *high priority* to be developed in future agricultural education graduates in Eswatini. These items were endorsed (banked) in Round I of the study, and those that fell outside the criteria were either escalated to Round II for re-rating or rejected. Based on the consensus criteria shown in Table 1, out of the thirty (30) items included in HAECCSQ 1, 22 items fell under the *Life and Career Skills* category; five under the *Learning and Innovative Skills* category; and three under the *Information, Media and Technology Skills* category. Among these, 23 items met the inclusion criteria and therefore, endorsed, seven (7) were escalated to Round II for re-rating and none was rejected (see Table 4). Fifteen (15) *Life and Career Skills* met the 80% inclusion rate in Round I which, included amongst others "*accountability*" [P=100%; IQR=0; Median 5], *"initiative"* [P=94.2%; IQR=0; Median 5], *"creativity"* [P=94.2%; IQR=0; Median 5], and *"critical thinking"* [P=82.2%; IQR=1; Median 5]. Skills such as *"Social skills"* [P=76.5%; IQR=2; Median 5], *"planning"* [P=76.4%; IQR=2; Median 5], *"planning"* [P=76.4%; IQR=2; Median 5], *"flexibility"* [P=71.0%; IQR=2; Median 4], *"social responsibility"* [P=70.6%; IQR=4; Median 4], *"citizenship"* [P=70.6%; IQR=2; Median 4], and *"metacognition"* [P=70.6%; IQR=2; Median 4] could not attain the required consensus and were escalated to Round 2 of the study. No skill, however, in this category was rejected. All five (5) Learning and Innovation Skills attained the required consensus as follows: *"problem-solving"* [P=94.1%; IQR=0; Median 5], "innovation*"* [P=94.1%; IQR=1; Median 5], *"collaboration"* [P=82.3%; IQR=1; Median 5], and *"Learning to learn"* [P=82.2%; IQR=1; Median 5]. None were escalated to Round 2 nor rejected in the category. All the three items *Information, Media, and Technology skills* reached the desired consensus in the first round as follows: "*technology literacy*" [P=100%; IQR=1; Median 5], *"information literacy"* [P=83.3%; IQR=1; Median 4] and *"media literacy"* [P=82.4%; IQR=1; Median 4]. Again, no skills were escalated to Round 2 nor rejected in the category.

Table 4

Twenty-first Century Skills prioritized by participants in Round 1 for inclusion in 2nd Round (n=17)

21st Century Skills	**Panel Rating**			
	% 4-5	**IQR**	**Median**	**Decision**
A. Life & Career Skills				
1. Accountability	100	0	5	**Endorsed**
2. Initiative	94.2	0	5	**Endorsed**
3. Creativity	94.2	0	5	**Endorsed**
4. Self-direction	94.1	1	5	**Endorsed**
5. Productivity	94.1	1	5	**Endorsed**
6. Leadership	94.1	1	5	**Endorsed**
7. Conflict management	94.1	1	5	**Endorsed**
8. Solving conflict	94.1	1	5	**Endorsed**
9. Ethics	94.1	1	4	**Endorsed**
10. Communication	94.1	1	5	**Endorsed**
11. Personal Responsibility	88.2	1	5	**Endorsed**

21st Century Skills	Panel Rating			
	% 4-5	IQR	Median	Decision
12. Adaptability	88.2	1	5	**Endorsed**
13. Risk-taking	88.2	1	5	**Endorsed**
14. Entrepreneurship	88.2	0	5	**Endorsed**
15. Critical thinking	88.2	1	5	**Endorsed**
16. Social skills	76.5	2	5	Escalated to Round II
17. Planning	76.4	2	5	Escalated to Round II
18. Flexibility	71.0	2	4	Escalated to Round II
19. Social Responsibility	70.6	2	4	Escalated to Round II
20. Citizenship	70.6	2	4	Escalated to Round II
21. Planning	76.4	2	5	Escalated to Round II
22. Metacognition	70.6	2	4	Escalated to Round II
B. Learning & Innovation Skills				
23. Problem- solving	94.1	0	5	**Endorsed**
24. Innovation	94.1	1	5	**Endorsed**
25. Decision making	88.2	1	5	**Endorsed**
26. Learning to learn	88.2	1	5	**Endorsed**
27. Collaboration	82.3	1	5	**Endorsed**
C. Information, Media & Technology Skills				
28. Technology literacy	100	1	5	**Endorsed**
29. Information literacy	88.3	1	4	**Endorsed**
30. Media literacy	82.4	1	4	**Endorsed**

Round I Cut-off: ≥80%Consensus Rate; ≤ 1 Interquartile Range (IQR): and ≥ 4 Median score [Endorsed]: ≤80% 4-5 and interquartile range ≥2 and Median < 4 [Escalated to Round II]: and ≤50% 4-5 and interquartile range ≥2 and Median < 4 [Rejected]

HAECCSQ 1 also included a section for participants to further suggest other 21st century skills that they deemed important for inclusion in the Eswatini higher agricultural education curriculum and the rationale. In this section, a total of 12 new items were generated by the experts as shown in Table 5 with rationale provided by experts. Under *Life and Career Skills* , eight new skills were suggested by experts in this category and include: '*resource management skills", "stress management skills", "networking skills", "time management skills", "interpersonal skills", "emotional intelligence skills", "organizational skills"* and "*numeracy skills*". Under *Learning and Innovation Skills*, two new skills were suggested by experts - *"research skills*" and "*lifelong learning skills*". Lastly, under *Information, Media and Technology skills* are two (2) additional skills suggested by experts -*"database skills"* and *"website design skills*". These new skills, together with items that met the "*Escalation to Round 2*" criteria, made a total of 19 items which were retained to be included in the Round 2 questionnaire (HAECCSQ 2) for rating and re-rating by experts, respectively.

Table 5
New 21st Century Skills suggested by participants in Round 1 for inclusion in 2nd Round (n=17)

21st Century Skills	Rationale
A. Life and Career Skills	
1. Resource management	*It is important that graduates learn how to optimally utilize and manage resources at their disposal.*
2. Stress management	*Critical for creating peace and harmony in the working environment.*
3. Networking	*Critical for creating peace and harmony in the working environment.*
4. Time management	*A very important skill to educators as can easily be transferred to future leaders under their care. Also, in the discipline, time is money.*
5. Interpersonal skills	*Graduates should be able interact effectively with others (colleagues, students and many more).*
6. Emotional Intelligence	*A very important skill in the discipline as human interaction is maximum.*
7. Organizational skills	*To effectively use time and resources.*
8. Numeracy skills	*A pre-requite skill to any aspiring entrepreneur*
B. Learning and Innovation Skills	
9. Research skills	*Very important for educators to remain up-to-date and provide solutions to problems in the discipline.*
10. Lifelong learning skills	*Critical to improve their relevance.*
C. Info, Media & Technology Skills	
11. Database skill	*As technology advances, such skills become critical to every scholar for relevance*
12. Website design skill	*As technology advances, such skills become critical to every scholar for relevance.*

Round II Findings - Modified Delphi Technique: Table 6 presents findings from Round II of the modified Delphi survey. In this round, 17 experts participated since a response rate of 85% was achieved in Round I. Participants were given HAECCSQ 2, where items that could not attain consensus in Round I, but could be escalated to Round 2, were further re-rated and newer items suggested by experts were rated, again, on a numeral scale of 1 (*Very Low Priority*) to 5 *(Very High Priority*). Measures of central tendency (percentage, interquartile range and median) were used to analyze data. In this round, all items that were able to reach consensus were retained for inclusion for the higher agricultural education curriculum in Eswatini. Items that could not reach consensus were automatically rejected.

Nineteen (19) items entered into this round and only 12 met the 80% consensus rate. These were consequently endorsed for inclusion into the Eswatini higher agricultural education curriculum. These include, amidst others 10 *Life and Career Skills* such as *"interpersonal skill"* [P=94.1%; IQR=1; Median 4], *"networking"* [P=94.1%; IQR=1; Median 4], *"time management"* [P=94.1%; IQR=1; Median 4], *"Stress Management"* [P=88.3%; IQR=1; Median 4] and *"Social skills"* [P=82.3%; IQR=1; Median 5]. Skills such as *"Emotional Intelligence"* [P=76.5%; IQR=2; Median 4], *"Numeracy skills"* [P=70.6%; IQR=2; Median 4] and *"Cross-cultural skills"* [P=58.9%; IQR=1; Median 4] did not reach consensus in this category and were rejected. Under the *Learning and Innovation Skills* category, two (2) skills; *"Research skills"* [P=89.2%; IQR=1; Median 5] and *"Metacognition"* [P=82.3%; IQR=1; Median 5] reached consensus. The *"Lifelong learning skills"* [P=76.5%; IQR=2; Median 5] could not reach consensus and was rejected. All skills suggested by the panel under the *Information, Media and Technology skills* category could not reach the desired consensus with all participants. The *"website design skills"* attained P=64.7%; IQR=2; and Median 4 and *"database skills"* attained P=42.9%; IQR=2; and Median 4. All were rejected in this category.

Table 6
21st Century Skills prioritized by participants in Round 2 (n=17)

21st Century Skills	**Panel Rating**			
	% 4-5	**IQR**	**Median**	**Decision**
A. Life & Career Skills				
1. Interpersonal skills	94.1	1	4	**Endorsed**
2. Networking	94.1	1	4	**Endorsed**
3. Time management	94.1	1	5	**Endorsed**
4. Planning	88.3	1	4	**Endorsed**
5. Stress management	88.3	1	4	**Endorsed**
6. Social Responsibility	88.2	1	4	**Endorsed**
7. Resource management	88.2	1	5	**Endorsed**
8. Organisational skills	88.2	1	4	**Endorsed**
9. Flexibility	82.4	1	4	**Endorsed**
10. Social skills	82.3	1	5	**Endorsed**
11. Emotional Intelligence	76.5	2	4	Rejected
12. Numeracy skills	70.6	2	4	Rejected
13. Citizenship	64.7	2	4	Rejected
14. Cross-cultural skills	58.9	1	4	Rejected
B. Learning & Innovation Skills				
15. Research skills	89.2	1	5	**Endorsed**
16. Metacognition	82.3	1	4	**Endorsed**
17. Lifelong learning skills	76.5	2	4	Rejected

21st Century Skills	Panel Rating			
	% 4-5	IQR	Median	Decision
C. Info Media & Technology Skills				
18. Website design skill	64.7	2	4	Rejected
19. Database skill	42.9	2	4	Rejected

Round 2 Cut-off: ≥80%Consensus Rate; ≤ 1 Interquartile Range (IQR): and ≥ 4 Median score [Endorsed]: ≤80% 4-5 and interquartile range ≥2 and Median < 4 and below [Rejected]

Summary of Round I and Round II Findings on 21st Century Skills to be included in the Eswatini higher agricultural education curriculum: Findings from the two- round modified Delphi technique on the dimension can be summed-up into 35 items endorsed for inclusion in the curriculum. These are summarized and shown in Figure 2 and Figure 3.

Figure 2

Flowchart showing number and outcomes of items in each Delphi Round on Dimension

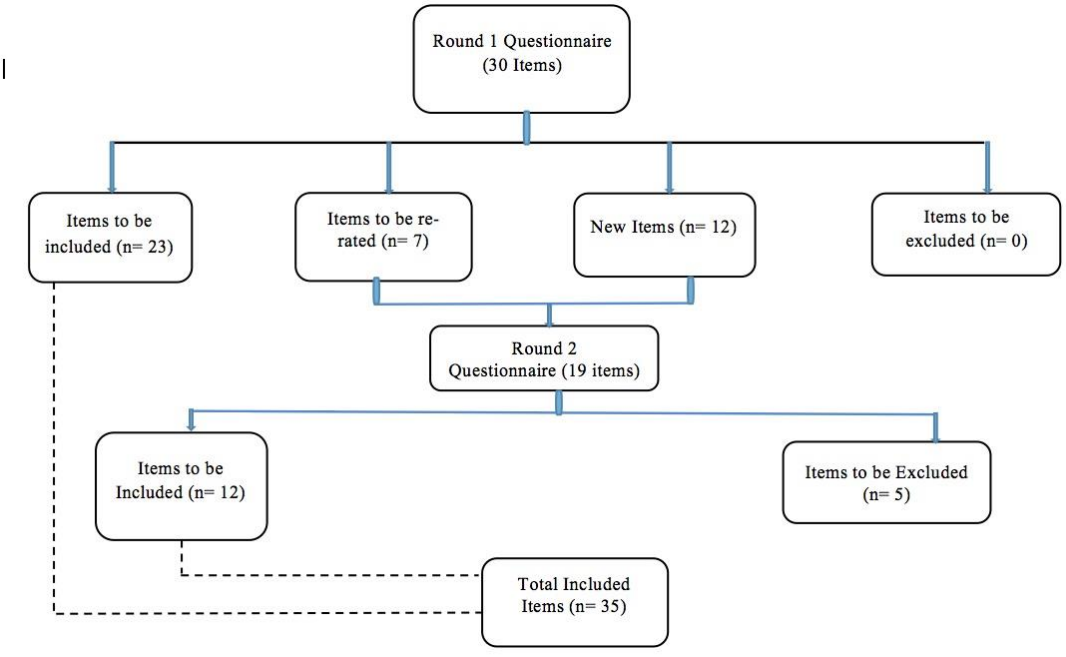


Figure 3

Summary of numbers and outcomes of modified Delphi rounds in the study

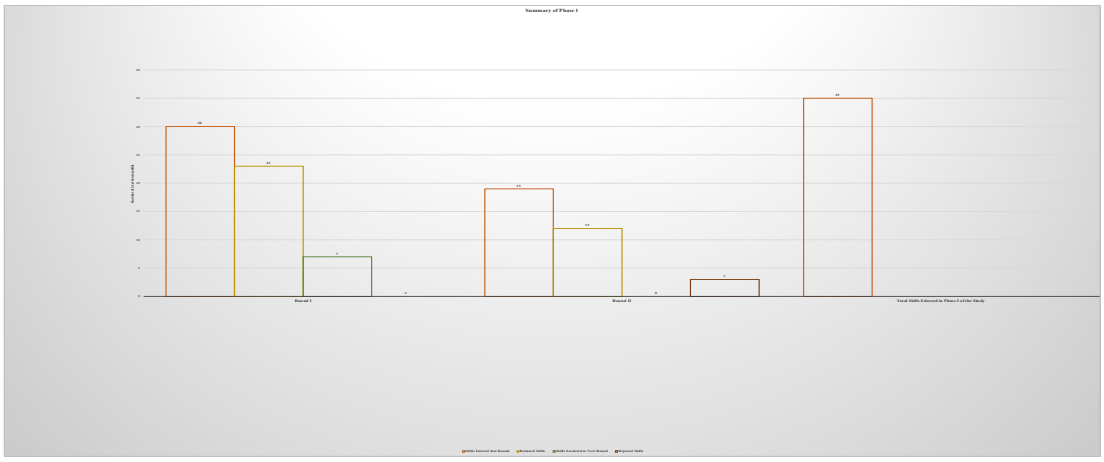
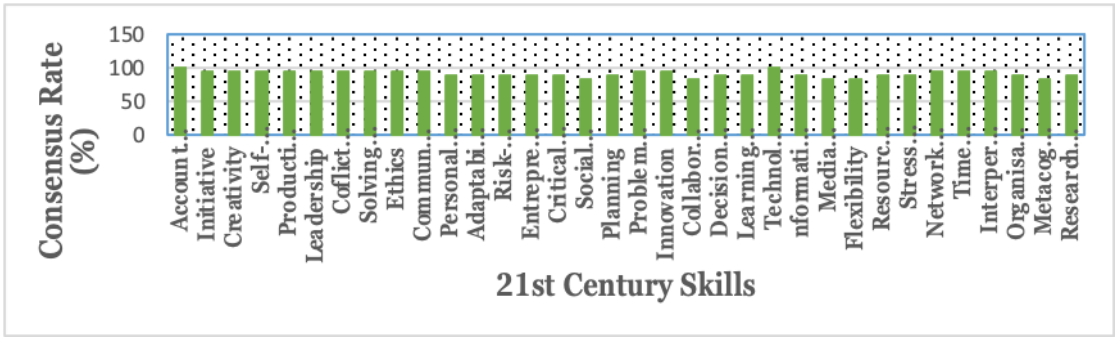


Figure 4 shows the specific skills and their consensus ratings endorsed in the two-rounds modified Delphi technique of the study for inclusion in the 21st Century Skills Framework for Higher Agricultural Education Curriculum in Eswatini. Skills that attained a 100% consensus rate were *"Accountability"* and *"Technology Literacy."* These were followed by *"Initiative," "Creativity,"* and *"Interpersonal skills"* amongst others with a consensus rate of 94.2%. *"Social skills"* and *"Collaboration"* received the least consensus of 82.3%. These skills made way to Phase II of the study (Survey) for validation by secondary and high school agriculture teachers in Eswatini.

Figure 4

21st Century Skills Endorsed in Phase I of Study and their Consensus Rating



Findings -The Survey (Phase II). A survey technique was conducted to achieve this objective. Survey questionnaire (HAECCSQ 3) had a list of 35 sub-dimensions (items)

on 21st century skills derived from Phase I of the study. These were also categorized into three groups namely: (i. *Life and Career Skills*; (ii). *Learning and Innovative Skills;* and (iii). *Information, Media and Technology Skills.* Respondents were asked to indicate on a numeral scale of 1 (*Very Low Importance*) to 5 (*Very Important)* those skills that they deem could be prioritized in the training of future agriculture teachers in Eswatini. Measures of central tendency of mean and standard deviation were used to analyse the data. In deciding on the items of high importance in HAECCSQ 3, the real limits of mean ranges which were utilized for decision making were as follows: Any item with a mean value of 5.00 was regarded as of Very Important; 4.00 – 4.99 = Important; 3.00 – 3.00 = Slightly Important; 2.00 – 2.99 = Unimportant and ≤ 1.99 = Very Low Important. Table 7 displays findings on the dimension and based on the importance level criteria, all 35 21st century skills identified by experts in Phase I of the study were rated important by secondary and high school agriculture teachers in Eswatini. Mean values ranged from M =4.50 to M = 4.02 with standard deviation values ranging from 1.01 to 0.63. The average mean values and standard deviation values were M=4.29; with SD=0.60. The three (3) most highly rated skills under the *Life and Career Skills* category were: *"Creativity"* [M=4.50; SD=0.76], "*Networking"* [M=4.43; SD=0.76] and *"Self-efficacy"* [M=4.34; SD=0.75]. Under the *Learning and Innovation Skills* category were: "*Innovation"* [M=4.45; SD=0.68], "*Decision making"* [M=4.45%; SD=0.68] and *"Problem solving"* [M=4.39; SD=0.75]. All three (3) skills under the *Information, Media and Technology skills* category were most highly rated with "*Technology literacy*" having M=4.51; with SD=0.69 being the highest. Standard deviation values of most skills were below 1.00. This indicated that the respondents' responses were not far from the mean and from one another in their responses. This added value to the reliability of the mean.

Table 7

21st Century Skills for Higher Agricultural Education Curriculum in Eswatini (n=198)

	21st Century Skills	**M**	**SD**	**Remark**
	A. Life & Career Skills			
1.	Creativity	4.50	0.76	**Important**
2.	Networking	4.43	0.76	**Important**
3.	Self-efficacy	4.34	0.75	**Important**
4.	Accountability	4.34	0.87	**Important**
5.	Initiative	4.33	0.78	**Important**
6.	Productivity	4.33	0.79	**Important**
7.	Leadership	4.43	0.84	**Important**
8.	Personal Responsibility	4.31	0.79	**Important**
9.	Flexibility	4.27	0.84	**Important**
10.	Time Management	4.27	0.93	**Important**
11.	Organizational skills	4.26	0.87	**Important**
12.	Communication	4.26	0.93	**Important**
13.	Solving conflict	4.24	0.87	**Important**
14.	Stress management	4.22	0.93	**Important**
15.	Interpersonal skill	4.21	0.79	**Important**
16.	Critical thinking	4.18	0.93	**Important**

	21st Century Skills	M	SD	Remark
17.	Adaptability	4.18	0.86	**Important**
18.	Entrepreneurship	4.17	0.97	**Important**
19.	Planning	4.16	1.00	**Important**
20.	Resource management	4.12	1.01	**Important**
21.	Risk taking	4.12	1.00	**Important**
22.	Social skills	4.07	0.98	**Important**
23.	Personal integrity	4.06	1.00	**Important**
24.	Social responsibility	4.04	0.99	**Important**
25.	Conflict management	4.03	0.99	**Important**
B	***Life & Innovation Skills***			
26.	Innovation	4.45	0.68	**Important**
27.	Decision making	4.45	0.64	**Important**
28.	Problem solving	4.39	0.75	**Important**
29.	Learning to learn	4.36	0.74	**Important**
30.	Research skills	4.33	0.76	**Important**
31.	Collaboration	4.23	0.77	**Important**
32.	Metacognition	4.22	0.81	**Important**
C	***Information, Media & Technology Skills***			
33.	Technology literacy	4.51	0.69	**Important**
34.	Information literacy	4.42	0.74	**Important**
35.	Media literacy	4.38	0.80	**Important**
	Average	**4.29**	**0.60**	**Important**

Importance Level Scale:
1=Very Low Importance; 2= Unimportant; 3=Slightly Important; 4=Important; 5=Very Important.
Cut-off Point: Mean value 4.45 - 5.00 = Very Important; 4.00 – 4.44 = Important; 3.00 – 3.45 = Slightly Important; 2.00 – 2.45 = Unimportant and ≤ 2.45 = Very Low Importance

Summary of Findings from Phase I (Two- rounds modified Delphi technique) and Phase II (Survey): In order for the researchers to fully address more the research problem, an interpretation-level integration occurred, connecting the data from Phase I of the study with the data from Phase II was also done using a joint display (Table 8). A joint display allows data to be visually brought together to "draw new insights beyond the information gained from the separate quantitative and qualitative results" (Fetters, Curry & Creswell 2013). As seen in Table 7, data obtained from Phase I was compared and contrasted to results from Phase II. Points of contention and areas of convergence between the two (2) phases were dissected in the final analysis phase in order to form meta-interferences, or an overall understanding developed through integration of data strands (Teddlie &Tashakkori, 2008). The connected data was interpreted within the scope of the study's purpose: to determine 21st century skills to be included in Eswatini's higher agricultural education curriculum. As presented in the table, data from the two-rounds modified Delphi technique suggested and agreed upon by experts in agricultural education in Eswatini was confirmed by secondary and high school agriculture teachers in the study. Opinions of both experts and agriculture teachers from Phase I and Phase II, respectively, merged towards one common outcome.

Hence, in the exploration and determination of a set of 21st century skills essential for the higher agricultural education curriculum in Eswatini, findings attained can be regarded as valid.

Table 8

Joint Display Comparison of Data from Phase 1(two- rounds modified Delphi) and Phase 2 (Survey)

Theme	Two-rounds Delphi data (N=17)	Survey Data (n=198)	Remark
21st century skills to be included in the future higher agricultural education curriculum in Eswatini	- Consensus rate attained on thirty-five (35) suggested and identified skills for inclusion in Framework ranged from **82.3%** to **100%** per skill.	- **100%** agreement on importance of all thirty-nine (39) skills for inclusion in Framework	**Convergence of opinions**

Discussion

Findings from the study revealed 35 twenty-first century skills rated important and should be prioritized for development in the higher agricultural education curriculum in Eswatini. Experts used in the study and secondary school agriculture teachers in Eswatini were in agreement that the higher agricultural education curriculum in Eswatini should offer the 21st century skills in the three categories, namely: (i) *Life and Career Skills*; (ii) *Learning and Innovative Skills*; and (iii) *Information, Media and Technology Skills*. Amongst these, twenty 25 skills were under the *Life and Career skills* category in-order of importance as: creativity. networking, self-efficacy, accountability, initiative, productivity, leadership, personal responsibility, flexibility, time management, organizational skills, communication, solving conflict, stress management, interpersonal skill, critical thinking, adaptability, entrepreneurship, planning, resource management, risk-taking, social skills, personal integrity, social responsibility, and conflict management. Under *the Life and Innovation skills*, seven skills were identified by experts and confirmed by secondary school agriculture teachers. These, listed in order of their importance include: innovation, decision-making, problem-solving, learning to learn, research skills, collaboration and metacognition skills. Last, but not least, three skills under the *Information, Media and Technology skills* category were identified and confirmed to include technology literacy skills, information literacy skills and media literacy skills. Experts from Phase 1 of the study reacted to a list of skills provided and suggested more, justifying the need for their development in future agricultural education graduates in Eswatini. In justifying the importance of the other 21st century skills, they expressed the following summarized views:

> "The skills demanded by the current employer in the market are now changing and agriculture teachers are becoming more and more irrelevant as they display a lack of the critical skills required in the 21st century"; "It is very important for agriculture teachers in the country remain current and up-to-date. This will keep them successful

and relevant, and will be able to provide solutions to problems in the discipline"; "As technology advances in the world, 21st century skills become critical to every scholar because in our discipline, time is money. Hence, it is very important for educators to develop critical skills such as time management, organizational skills, planning skills, decision making skills, networking skills, and many more to name a few. In addition, they should learn how to easily transfer these to future leaders under their care.

Such views and list of skills identified were confirmed by secondary school agriculture teachers in Phase II of the study where all the skills were rated important and hence valid for an inclusion in the higher agricultural education curriculum in Eswatini. These findings are in line with sentiments obtained in the popular 21st century skills frameworks such as the "Framework for 21st Century Learning" by the Partnership for 21st Century Skills, the Key Competences for Lifelong Learning by European Parliament, and the Council of the European Union adopted by many countries because of their broader application (21st Century Skills Handbook, 2020). All these frameworks focus on a set of skills and standards deemed essential for the 21st century and skills such as, creativity, networking, self-efficacy accountability, innovation, problem solving, collaboration, technology literacy, information literacy and media literacy have been listed. The P21 Framework Partnership for 21st Century Learning (2019) for example. listed skills such as creativity, critical thinking, problem-solving, productivity, learning to learn, self-direction, flexibility, adaptability, manage and solve conflicts skills and entrepreneurship as critical and were identified and rated important in the study. The difference, however, is that they are adapted to different fields, contexts and environments around the globe, underscoring the need and importance of the current study in Eswatini.

Findings enabled researchers to develop a 21st century skills list adapting to the Eswatini context. Despite their variations, however, Care et al. (2018) confirm that all the frameworks converge on skills that are multidisciplinary, multimodal, and transferable, with a common emphasis on applying the knowledge one have acquired to solve ill-structured real-life problems in a digital era. Voogt and Roblin (2010), in their study that took on an in-depth analysis of the important 21st century skills required by students in the 21st century, are also in accordance with the current study findings since they enlisted skills such as collaboration, communication; ICT literacy, social and/or cultural skills and citizenship amongst others as important for today's generation to thrive and succeed in the world of work and life. In addition to these, more skills that suited the agricultural education discipline in Eswatini context were suggested in the current study. These included self-efficacy, accountability, productivity, leadership, teamwork. personal responsibility, flexibility, time management, organizational skills, solving conflict, stress management, interpersonal skill, adaptability, entrepreneurship, planning, resource management, personal integrity, social responsibility, conflict management, learning to learn, research skills, metacognition skills and media literacy skills. This additional finding is supported by Fisher and Thijs (2015), who accentuate that skill prioritization in any area, cannot be overemphasized because most of the 21st century skills identified in the various frameworks have different focus areas, resulting in a variation in their perceived importance in each field, discipline, or area of specialization.

The Lumina Foundation (2018), in accordance with the study findings also emphasized that the workplace skills employers consider most important to today's agricultural education graduates are critical thinking and problem-solving, collaboration and teamwork, communication, and the technical skills associated with the job. These skills coincide directly with the 21st century skills reported by the Partnership for 21st Century

Learning (Battelle for Kids, 2020), all of which have been embraced in career and technical education (Clark et al., 2010). In line with the above, results of a cross-institutional assessment conducted by Michigan State University in collaboration with the Association of Public and Land-grant Universities (APLU) and the University Industry Consortium revealed that employers and alumni today value soft skills such as communication, decision-making, problem-solving skills, and teamwork. This further cements the study's findings and suggests that future agriculture teachers will require these skills in order to make a successful transition from university to competitive work in teaching and/or in agriculture, natural resources, and related fields. As cited by DiBenedetto et al. (2018), agricultural education is changing and so are the future jobs and careers in agriculture, consequently, as recommended by the World Economic Forum (2019), there is a high demand for individuals to be upskilled and reskilled as their occupations increasingly require the use of disruptive technologies. This therefore, validates the study findings and importance for their development in future agricultural education graduates in Eswatini.

Conclusions

In the Kingdom of Eswatini, there appears to be a mismatch between the skills demonstrated by agricultural education graduates and those valued by their employers. The study looked at the 21st century skills crucial for inclusion in Eswatini's higher agriculture education curriculum due to the emerging demands of knowledge-based economies. These skills were particular to the modern information age, ensuring that the University of Eswatini's agricultural education curriculum was in line with the needs of the 21st century. Based on the study's findings and guided by the Partnership for 21st Century Learning's Framework for 21st Century Learning (2019), it is anticipated that UNESWA's agricultural education curriculum will contain the 21st century skills including creativity. networking, self-efficacy, accountability, initiative, productivity, leadership, personal responsibility, flexibility, time management, organizational skills, communication, solving conflict, stress management, interpersonal skill, critical thinking, adaptability, entrepreneurship, planning, resource management, risk-taking, social skills. personal integrity, social responsibility and conflict management under the *Life and Career skills* category. Further, innovation, decision-making, problem-solving, learning to learn, research skills, collaboration, and metacognition skills are under *Life and Innovation skills.* Moreover, technology literacy skills, information literacy skills and media literacy skills under the *Information, Media and Technology skills* category. These skills could be taught through the use of effective teaching techniques like team teaching, group discussions, peer tutoring, instructional games, simulations, and relevant others. They can then also be assessed by embracing newer and innovative assessment strategies such as the "21st century learning and innovation skills" scale; performance- based assessment; and project assessment. This suggests a huge transformation of the current higher agricultural education curriculum in Eswatini, with agricultural education experts and practitioners backing on the use of the determined 21st century skills framework in the teaching and learning at schools in Eswatini.

Recommendations

For practice, it is recommended that:

1. Lecturers in the Department of Agricultural Education and Extension, UNESWA, use the study findings to update and amend the current agricultural education curriculum so that it is in line with the 21st century's educational objectives;
2. The Ministry of Education and Training should also use of the study's findings to give the University more financial support by further developing the facilities; aiding in the purchase of the equipment/tools and resources that will best support the development of 21st century skills in graduates of agricultural education;
3. The national curriculum designers should work with the Ministry of Education and Training, UNESWA agricultural education lecturers, and Schools Agriculture Inspectorate to lead in developing a list of 21st century skills that will guide the secondary school curriculum and consequently, the higher agricultural education curriculum at the University of Eswatini.
4. Additionally, in order to promote a seamless transfer of 21st century skills development learned at tertiary level to students in schools, the Schools Agriculture Inspectorate could use the study's findings to plan in-service training programs with UNESWA agricultural education instructors for teachers who are already in the field on the specific 21st century skills they need.

The following studies are recommended for further investigation:

1. Factors Influencing the Effective Development of 21st Century Skills in Agricultural Education Students at the University of Eswatini, Luyengo.
2. Capacity Building Needs of Agriculture Education Lecturers on the Effective Use of 21st Century Teaching Pedagogies at the University of Eswatini, Luyengo.

Following the adoption of the 21st century skills recommended in the study for future agricultural education graduates in Eswatini, follow-up studies on the graduates' employers and on the graduates themselves should be conducted to assess how well they performed in the workplace and in everyday life.

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