Africa RISING ESA project: Integrated Livestock Feed component (ILF)

Fodder and feed as a key opportunity for driving sustainable intensification of crop-livestock systems in Tanzania

The effect of disseminating livestock extension messages using SMS on knowledge, attitude and practices of smallholder farmers

A case study of using the MWANGA Platform in Tanzania

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The Africa Research In Sustainable Intensification for the Next Generation (Africa RISING) program comprises three research-in-development projects supported by the United States Agency for International Development (USAID) as part of the U.S. Government's Feed the Future initiative.

Through action research and development partnerships, Africa RISING is creating opportunities for smallholder farm households to move out of hunger and poverty through sustainably intensified farming systems that improve food, nutrition, and income security, particularly for women and children, and conserve or enhance the natural resource base.

The three regional projects are led by the International Institute of Tropical Agriculture (in West Africa and East and Southern Africa) and the International Livestock Research Institute (in the Ethiopian Highlands). The International Food Policy Research Institute leads the program's monitoring, evaluation and impact assessment.

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1. Introduction

Smallholder farming systems are characterized by the production of forage and fodder in sub-optimal levels integrated with other aspects of agricultural production. By growing and utilizing greater quantities of locally produced high-quality forages, livestock production costs can be reduced without compromising productivity, thus increasing on-farm sustainability (Lukuyu et al. 2018). Introducing improved forages into small-scale mixed farming systems would reduce the competition for land by utilizing the same land for both crop and forage production (Lugusa et al. 2016). Smallholder farmers in Babati District keep an average of 3-4 heads of cattle per household. A feed assessment (FEAST) survey conducted in 2015 identified the availability of adequate feeds in terms of quantity and quality as one of the factors constraining smallholder dairy production (Lukuyu et al. 2015). Further, access to extension services is limited leading to limited knowledge of good livestock production practice (Chakoma & Chummun, 2019). High livestock productivity, reduction in the incidence of pests and diseases and quality of produce as well as increased farm incomes can be realized through increased access to quality extension services (Marwa et al., 2020).

In Tanzania, agricultural extension services are provided by extension workers through farm visits promoting the adoption of new technologies (Sanga et al., 2013). However, this approach is often constrained by limited extension personnel who are often demotivated with the working condition and there is a relatively low farmer to extension personnel ratio. Given these limitations, the government together with its development partners have developed innovative approaches to enhance extension service provision (Marwa et al., 2020; Sanga et al., 2013). This includes the use of information and communication technologies (ICT) in the delivery of extension services to farmers. Several studies have shown that the use of ICT technologies to promote extension services increases agricultural productivity and incomes thereby improving the welfare of farmers (Das et al., 2016; Nyaga, 2012).

Several ICT technologies that are mobile-based have been developed and deployed to farmers in Tanzania. These programs include Farmer Voice Radio (FVR), Nyanya ni Pesa and MWANGA platform. The success of such platforms can be attributed to the increased use of mobile phones in Africa. The current study focuses on the MWANGA platform that seeks to bridge the information gap among smallholder farmers. MWANGA platform is a toll connecting farmers to vital information to improve decision making. It is on foregoing that

this study was aimed at evaluating how short message service (SMS) technology can reduce key knowledge gaps amongst smallholder farmers and enhance the adoption of technologies.

2. Methodology and study design

The study incorporated both qualitative and quantitative research drawing data in Babati district, Tanzania. The fieldwork took place within the Africa-RISING project sites in Tanzania. A baseline was conducted to assess the current Knowledge, Practices, and Attitudes prior to the intervention of 100 farmers. Using the MWANGA platform, short and clear livestock extension messages aimed at increasing dairy and poultry productivity were disseminated to 100 farmers using the mobile phone Short Message Service (SMS) spanning across 13 villages within Babati District. This was followed by an end line assessment after 14 weeks of SMS dissemination. Focus group discussions were conducted in five sites (Endaberg/Riroda, Bashnet, Bermi, Shauri Moyo and Haysam villages) to get insights from farmers on their experiences with messages disseminated through the MWANGA platform.

3.0 Results and Discussion

3.1 Effect on knowledge and practice

Figure 1 indicates the level of awareness with the Africa RISING project in Babati.

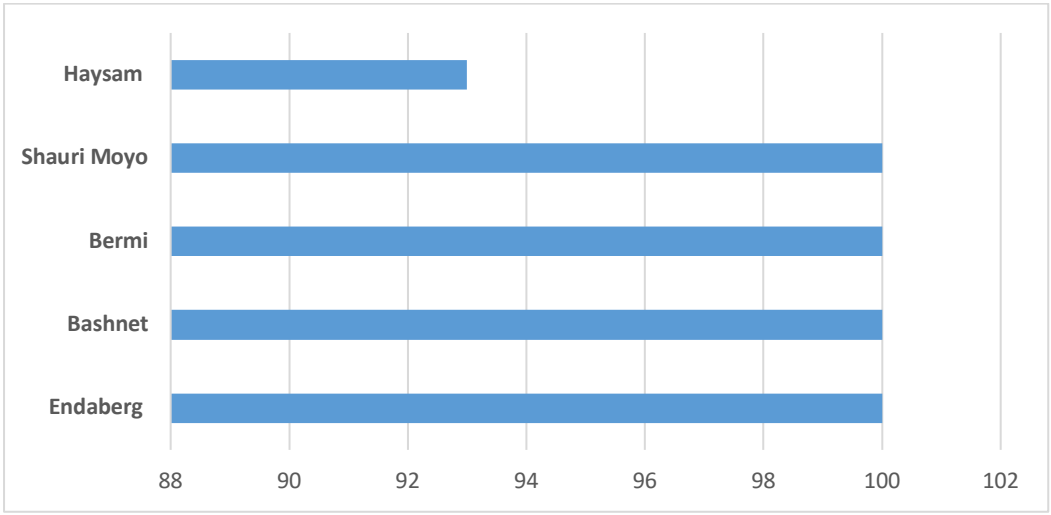

Figure 1: Awareness with the Africa RISING Project (FGD)

It is observable that across all the sites visited, farmers were aware of the Africa Research in Sustainable Intensification for Next Generation (Africa RISING) project within the area. Some farmers highlighted the existence of the project spanning across a period of three years and that the project provided interventions on fodder and management of animals (feeding).

Farmers also recalled other interventions given to them including training on feed formulation, feed chopping, and extension messaging through the MWANGA platform. Figure 2 shows some of the livestock interventions farmers in Babati have participated:

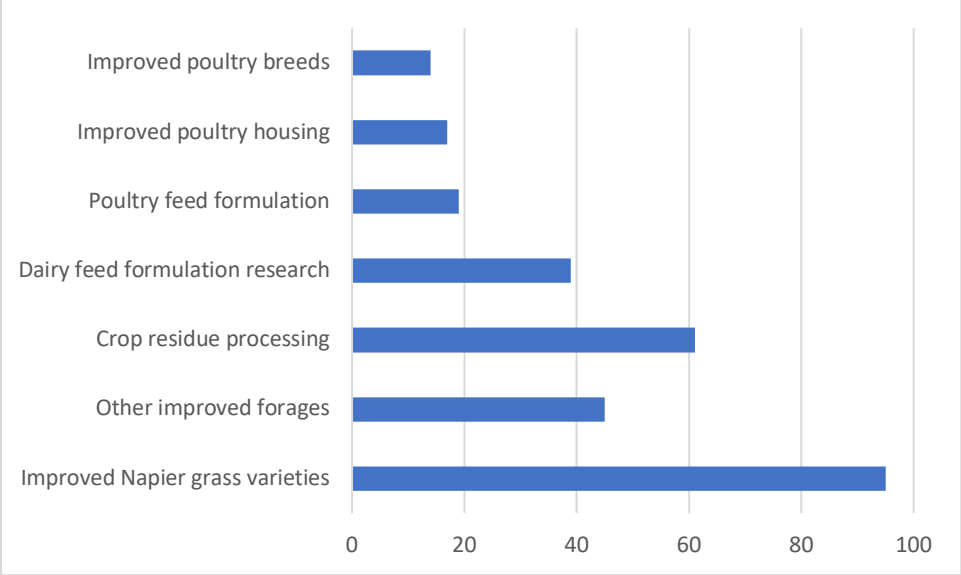

Figure 2: Participation of farmers in livestock intervention (Individual survey)

Some of the fodder varieties identified by farmers included improved Napier grass varieties (Kakamega I & II, ILRI (however farmers could not remember accession number), & Ouma II), Guatemala grass, Desmodium and Lucern legumes. Figure 3 shows the improved Napier grass varieties identified by farmers in Babati:

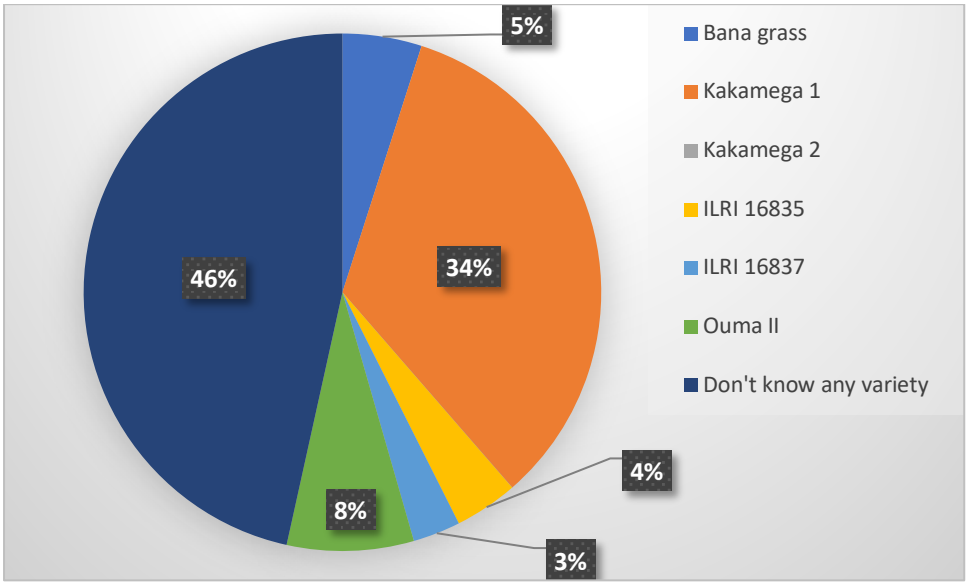

Figure 3: Napier grass varieties identified by farmers in Babati (Individual survey)

In both baseline and end-line data, the majority of the farmers (over 90%) had received training on some of the livestock interventions introduced through the Africa Rising project. Figure 4 shows the distribution of farmers that were trained and adopted improved fodders:

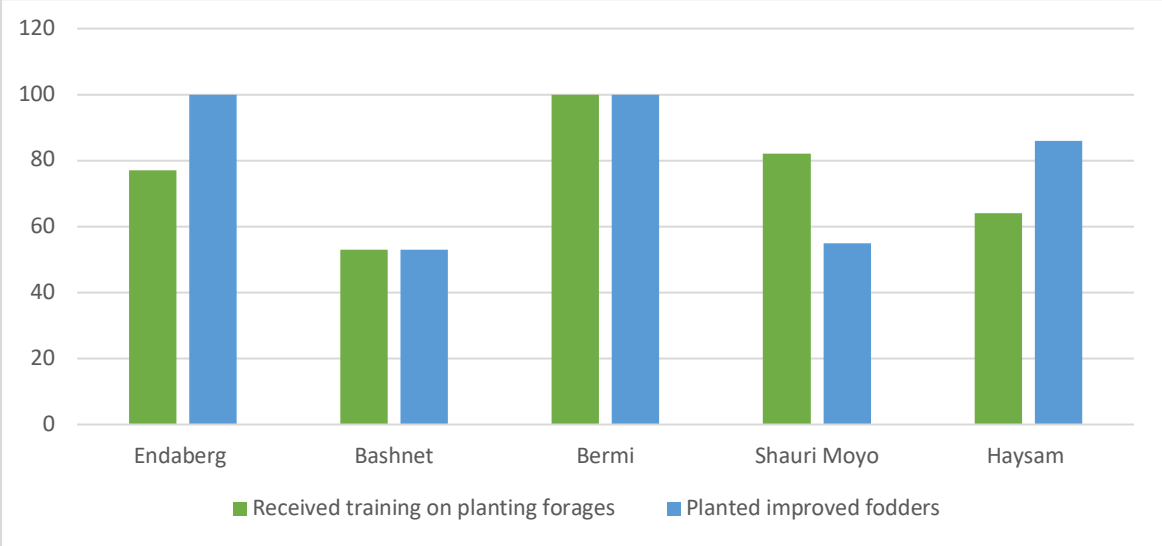

Figure 4: Farmers trained and adopted improved forages in Babati District, Tanzania

In some villages, for example Endaberg and Haysam, the number of farmers trained is lower compared to the number of farmers that have adopted. In the FGDs, farmers noted that while some farmers were trained, they took initiative and taught their farmers on the new knowledge they had received from the Africa RISING project. They share planting materials with their peer farmers and showed them how to plant and maintain the forages. Peer learning among farmers and ease of access to planting materials in Babati district has contributed to the increased rates of adoption of improved fodders. In contrast, farmers were aware of the benefits of feed chopping and feed formulation such as reduced demand for labour and better quality feed but did not adopt or practice the technologies after receiving the training. Farmers cited poor access to feed choppers supplied by the Africa RISING project in terms of long-distance and many farmers having to share one machine. They also cited the lack of enough feed for chopping and mixing as well as low milk prices and unreliable milk markets as barriers to the adoption of these feed practices. The cost involved in feed mixing is higher than the returns realized through the sale of milk. Comparing the before and after effect of the MWANGA platform extension messaging on knowledge and practices, the platform has had some positive effects as shown in table 1. Using Chi^2 analysis, we can observe that there is no significant difference in knowledge by farmers on the different Napier grass varieties.

Table 1: Change in Knowledge and practice among smallholder dairy farmers in Babati, Tanzania

	Proportion		Chi^2 test (Baseline & End line)
	Baseline (n = 101)	**End line (n= 74)**	**χ2-value**
Knowledge area			
Type Napier grass variety	53.4%	56.8%	0.187
Number of times increasing biomass of Napier grass	89.1%	93.2%	0.879
Forage yield per acre per year for improved Napier grass	9.9%	20.27%	3.750**
At what height should you harvest Napier grass	91.1%	90.5%	0.016
Advantage of planting forages	100%	100%	-
Advantage of chopping forages	100%	100%	-
Advantage of animal housing	100%	100%	-
Three essential nutrients for calf growth	33.7%	63.5%	15.306***
First calving age of a heifer	72.2%	81.1%	1.815
How much water does a high yielding cow require	21.8%	74.3%	47.851***

***, ** and * represent levels of significance at 1%, 5% and 10%, respectively.

As observed, there was a significant improvement in knowledge on forage yield for improved Napier grass. At baseline, only 9.9% of the respondents knew the average yield of improved Napier grass compared to 20.27% at end line. Similar findings are observed in improved knowledge of the three essential nutrients for calf growth and the water requirements for a high yielding cow. The MWANGA SMS significantly improved the knowledge of farmers on animal nutrition and forage management.

Figure 5 shows the distribution of farmers who received extension messages and the extent of sharing the messages:

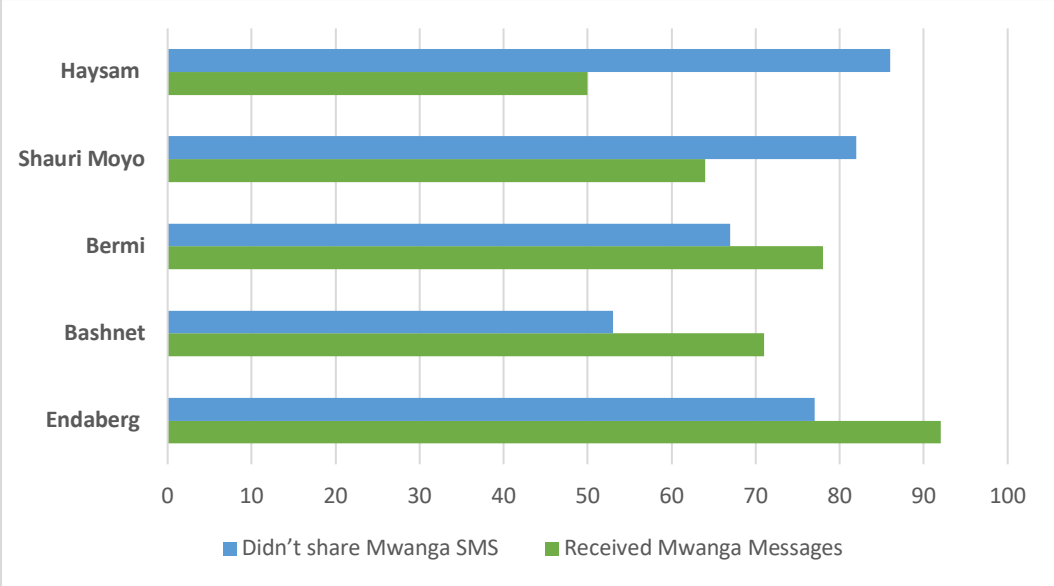

Figure 5: Number of farmers receiving SMS via MWANGA and the rate of sharing extension messages

Farmers who received extension messages via the MWANGA platform noted that the messages were simple, timely, and in a language, they all understood (Kiswahili). The content of the messages was actionable; however, they did not share messages with other farmers. Farmers who shared the messages did so in fora such as barazas or during social gatherings with their friends. Farmers reported that they did not realize that it was important to share the messages with their friends and peers. Additionally, there was no explicit instruction for them to share information with other farmers. Therefore, it is recommended that an initial message should be added to the SMS content at the beginning encouraging farmers to share information with fellow farmers.

3.2 Effect on attitude and behavior

The study also sought to assess the effect of the SMS platform on the attitude and behaviour of farmers. Intrinsic factors such as the perception of technology are correlated with the adoption of that technology (Adesina & Baidu-Forson, 1995). Therefore, the effect of the MWANGA platform on the attitudes of farmers will affect the behavior of farmers in regard to the uptake of any intervention. Table 2 shows the effect of the SMS platform on farmers' attitude and behavior:

Table 2: Change in attitude and behavior among smallholder dairy farmers in Babati, Tanzania

	Mean score (7 point Likert scale)		T-test (Baseline & End line)	
	Baseline (n = 101)	End line (n= 74)	Mean difference (Baseline & End line)	t-value
Attitude and Behavior				
Farmer primary objective is production & marketing of milk & meat	5.70 (1.27)	5.65 (1.04)	-0.054	0.311
Keeping exotic breeds is advisable for smallholder farmers	6.55 (0.73)	6.95 (0.28)	0.39	4.927***
Farmers choose forages based on their yield	6.05 (1.43)	6.39 (1.28)	0.342	1.662*
Farmers do not adopt improved forages due to lack of awareness	5.62 (1.70)	5.64 (1.41)	0.011	0.048
Farmers don't take advice on feeding practices from researchers/extension workers	4.72 (1.8)	4.74 (1.74)	0.02	0.076
Better formulated feeds yields better benefits	6.36 (0.855)	6.72 (0.90)	0.36	2.669***
Farmers understand well on-farm own feeds formulation	4.11 (1.88)	4.46 (1.75)	0.351	1.27
Feed chopping interventions is beneficial to smallholder farmers	6.56 (0.61)	6.74 (0.89)	0.179	1.49
Feed chopping interventions works well through farmer groups	5.07 (1.86)	5.09 (1.96)	0.03	0.086
Farmers understand cost & benefits and is a key factor in adoption	4.96 (1.90)	5.66 (1.48)	0.7	2.741***

***, ** and * represent levels of significance at 1%, 5% and 10%, respectively. (standard deviation) in parentheses

There is a significant difference at 1% level in attitude towards farmers keeping exotic/improved breeds. We can reject the null hypothesis and conclude that MWANGA extension messaging has a positive change in the attitude of farmers in that farmers strongly agree that it is advisable for smallholder farmers to keep improved breeds such as Friesian cows. A similar conclusion can be drawn on the attitude of farmers towards the choice of forages. At 10% level of significance, we can conclude that farmers agree that they generally choose forages based on their yield of biomass. This is linked to the information shared with them via the extension messaging.

Though not significant, the majority of the farmers interviewed in both the baseline and end-line agreed that farmers generally do not adopt improved forages due to lack of awareness. Therefore, future interventions should consider creating awareness of existing forage technologies to increase uptake.

Consequently, the attitude of farmers towards feed formulation was also positively influenced by the extension messaging. Farmers sited and strongly agreed that better formulated feeds yield better benefits than feeding different feed ingredients. At 1% level of significance we can reject the null hypothesis and conclude that extension messaging improves farmers' attitude towards feed formulation. Therefore, there will be higher uptake of interventions on feed formulation.

The costs and benefits associated with different strategies/technologies is a key factor in the adoption among farmers. As noted, the majority of farmers agree that cost and benefit analysis of technology is a key factor they would consider when adopting technologies. At 1% level of significance, the extension messaging positively changed farmers' attitudes towards this statement. Therefore, we can conclude that farmers' assessment and awareness of the cost and benefits of technology increases the likelihood of adoption. Extension messaging hence plays an important role in promoting the uptake of new technologies.

4. Conclusion

Africa RISING project has through the use of MWANGA platform to disseminate livestock messages has increased the awareness and adoption of improved forages; and icreased knowledge on feed formulation in Babati district and hence improved livestock productivity. Consequently, the mobile phone SMS through the MWANGA platform can contribute to improved attitudes and changes in behavior towards interventions. Peer learning among farmers and the ease of access to planting was a motivation for the increased adoption of the technologies. Farmers are aware that feed chopping and mixing interventions have contributed to the reduced labor burden in sourcing for livestock feed and have the potential to increase productivity. However, the low milk prices and unreliable milk market is a disincentive for a farmer to adopt such high input technologies. It was clear that while farmers' knowledge about the intervention had greatly improved, adoption remained low. The MWANGA platform has proved a valuable extension approach of reaching out to as many farmers as possible. The results showed that farmers need to be prompted and reminded to share information with other farmers during the duration of disseminating messages to widen the reach of the information. One of the key recommendations by farmers on the platform is to make it more interactive. Farmers would wish to interact with the platform and ask questions and or share their experiences on crop and livestock production challenges.

References

Adesina, A.A. and Baidu-Forson, J. 1995. Farmers' perceptions and adoption of new agricultural technology: evidence from an analysis in Burkina Faso and Guinea, West Africa. *Agricultural Economics*. https://doi.org/10.1016/0169-5150(95)01142-8

Chakoma, I. and Chummun, B.Z. 2019. Forage seed value chain analysis in a subhumid region of Zimbabwe : perspectives of smallholder producers Forage seed value chain analysis in a subhumid region of Zimbabwe : perspectives of smallholder producers. *African Journal of Range & Forage Science*. https://doi.org/10.2989/10220119.2018.1546229

Das, S., Munshi, M.N., and Kabir, W. 2016. The Impact of ICTS on Agricultural Production in Bangladesh: A Study with Food Crops. *SAARC Journal of Agriculture 14*(2): 78–89. https://doi.org/http://dx.doi.org/10.3329/sja.v14i2.31247

Lugusa, K.O., Wasonga, O.V., Elhadi, Y.A. and Crane, T.A. 2016. Value chain analysis of grass seeds in the drylands of Baringo County, Kenya: A producers' perspective. *Pastoralism 6*(1): 1–15. https://doi.org/10.1186/s13570-016-0053-1

Lukuyu, B.A., Ravichandran, T., Maass, B., Laswai, G., Bwire, J. and Duncan, A.J. 2015. *Enhancing livestock productivity through feed and feeding interventions in India and Tanzania*. Nairobi, Kenya. https://doi.org/92–9146–441–4

Lukuyu, B., Franzel, S. and Ongadi, P. 2018. Livestock feed resources: Current production and management practices in central and Northern Rift Valley provinces of Kenya. *Livestock Research for Rural Development 23*(5).

Marwa, M.E., Mburu, J., Elizaphan, R., Oburu, J., Mwai, O. and Kahumbu, S. 2020. Impact of ICT Based Extension Services on Dairy Production and Household Welfare : The Case of iCow Service in Kenya. *Journal of Agricultural Science 12*(3): 1–12. https://doi.org/10.5539/Accepted

Nyaga, E. 2012. Is ICT in Agricultural Extension Feasible in Enhancing Marketing of Agricultural Produce in Kenya: A Case of Kiambu District. *Quarterly, Journal of International Agriculture*.

Sanga, C., Kalungwizi, V.J. and Msuya, C.P. 2013. Building an agricultural extension services system supported by ICTs in Tanzania : Progress made, Challenges remain. *International Journal of Education and Development Using Information and Communication Technology 9*(1): 80–99.