

Intervention mapping as a framework for planning the implementation of urine diversion toilets and Ecosan education in a community school in Kavre, Nepal

Roshani Rajbanshi, Sheri Bastien, Manoj Pandey, Bipana Sharma, and Bal Chandra Luitel

Abstract: *Use of human excreta as fertilizer is not a new concept. However, with the use of the modern water-flush toilet, human excreta becomes mixed with water and causes environmental pollution. To reemphasize the nutritional value of human urine in the field, a urine diversion toilet was constructed in a community school situated in Kavre, Nepal. The purpose of establishing the urine diversion toilet is to improve hygiene outcomes through promoting proper sanitation and transforming the school community's regular practice and attitudes towards urine as a resource. To ensure effective implementation of the urine diversion toilets, intervention mapping was used as a guiding framework. The aim of this paper is to document how the urine diversion toilet was planned and implemented in the school and how the urine diversion toilet was connected with the curriculum to address concerns regarding water, sanitation, and hygiene with a focus on sustainability through intervention mapping. This study highlights the benefits of intervention mapping as a systematic and step-by-step process for the planning and implementation of the urine diversion toilet. This study also highlights the benefits of connecting urine diversion toilets with school gardening, and engaging with local government and other stakeholders about the value of the approach.*

Keywords: Ecosan, intervention mapping, Nepal, participatory action research, urine diversion toilet

ECOLOGICAL SANITATION (ECOSAN) IS AN alternative to conventional sanitation, which utilizes human waste in agriculture. Ecosan closes several cycles such as the water cycle, nutrient cycle, and energy cycle (Panesar et al., 2006). Human waste is rich in nutrients, but the nutrients often go to waste and usually cause environmental pollution. Ecosan is based on three main principles: it prevents pollution, sanitizes the human excreta, and uses them in the field (Chariar and Sakthivel, 2011). Hence, Ecosan is proposed as a new sanitation paradigm and sustainable alternative to conventional sanitation (Panesar et al., 2006).

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In the context of Nepal, wastewater is a topic of substantial importance to hygiene, development, and sustainability. There is a lack of proper sewer management in urban areas and dumping of human waste in water bodies is commonly practised (Shrestha et al., 2017). Thus, Ecosan has been put forth as a viable and more sustainable alternative which focuses on utilization of the waste (Maurya, 2012).

Furthermore, a 'one school: one garden' policy has been initiated by the government to promote environmentally friendly schools (Edusanjal, 2018). If the school does not have fertilizer, commercial fertilizer will be used. Using human excreta in the field not only promotes organic farming, it also prevents environmental pollution (Kaggwa et al., 2003). Furthermore, it fulfils Sustainable Development Goals (SDGs) 2, 4, and 6. SDG 2 is associated with ending hunger, achieving food security, improving nutrition, and promoting sustainable agriculture, which ultimately improves the nutritional status of the agricultural land. Whereas SDG 4 is related to providing inclusive and equitable quality education, which can be obtained when the students are healthy and attend school regularly. SDG 6 refers to sustainable management of water and sanitation. Locally grown food contributes to ensuring food security and consumption of organically grown food contributes towards a healthy life of the children. Against this backdrop, the project named Rupantaran established a urine diversion toilet (UDT) in a public school located in rural Kavre, Nepal.

The aim of Rupantaran is to contribute new knowledge concerning innovative approaches to improve the quality of teaching and learning in resource-constrained settings of Nepal, as well as to ensure sustainable positive developmental outcomes across education, hygiene, and livelihood domains. The aim of this paper is to document how UDT was planned and implemented in the school and how UDT was connected with the curriculum to address concerns regarding water, sanitation, and hygiene (WASH) with a focus on sustainability through intervention mapping.

To ensure an effective implementation of UDT, Bartholomew et al.'s (2006) intervention mapping was used as a framework to guide planning, implementation, adoption, evaluation, and sustainability of UDT. Intervention mapping is an iterative systematic approach based on theory as well as evidence-based hygiene promotion programmes. The intervention mapping approach was an important planning tool to attempt to promote theory-based positive behavioural changes in the school community as well as the health of the students and to improve learning outcomes. Furthermore, this article also describes how a participatory approach was used to engage different stakeholders who are the end users, implementers, and maintainers of UDT, which is an important factor for the sustainability of UDT.

Ecosan has been practised throughout the world. For instance, during Roman times, urine was collected through a urine diversion toilet and used for washing clothes. China is another example of a country that used human excreta in the field to maintain soil fertility, and keep up with the food demand of a growing population for centuries (Panesar et al., 2006). Much research has been conducted across the world on the effective use of urine in the field (GIZ 2012; Simha and Ganesapillai 2017). GIZ (2012) reports that around 74 countries have used Ecosan technology and Nepal is one of them. In Nepal (especially in Bhaktapur), from ancient times,

the use of fresh human faeces in the field by an ethnic group (Newar) has been mentioned in the literature. For instance, the Newar community in Kathmandu Valley and the Sherpa community in Solukhumbu have a long history of using human excreta as fertilizer in the field (Pradhan, 2008).

Methods

Description of the Rupantaran project

The project focused on improving teaching and learning outcomes through co-developing contextualized educational curricula with local teachers, and providing informative sessions for the stakeholders. This participatory planning approach is necessary to ensure that Ecosan is well understood so that the stakeholders can inform the development of project materials and activities to ensure cultural and contextual relevance, thereby contributing to the project's overall sustainability. Twenty-one teachers were involved who were responsible for the intervention related to Ecosan in their classroom. Engaging teachers and students actively and authentically in the development of all aspects of the project is at the core of this study's approach.

This project aims to bring a transformation in knowledge by educating the students, having linked the activities of UDT with curriculum and classroom; changing attitudes by providing information on urine and its nutrient values so it is seen as a resource rather than as waste; and changing the practice of the students through behaviour change in proper use of UDT. Furthermore, through UDT, this project aims to bring about change in the hygiene of the school community (through WASH), transform their learning and regular practice (use of urine in the garden and linking it with the classroom), and change attitudes (urine as resource versus urine as waste).

At the outset of the project, a *needs assessment* was conducted by the research team which identified ecological sanitation and the UDT as one of the main needs of the school. Discussion with community stakeholders covered how the introduction of the UDT could help address the issues of poor hygiene including diarrheal disease, lack of water to flush the toilet, environmental pollution due to discharge of the untreated human waste, and the use of chemical fertilizers in the fields. Within the areas of public health and hygiene promotion, it is frequently argued that schools are the most cost-effective settings to implement interventions to bring about behaviour change, since the students spend most of their time in the school and since there is potential to reach a wider audience including teachers, parents, and other community stakeholders (Kretschmann, 2011). Thus, with an intention of improving the sanitation and hygiene-related behaviours of the school community and improving educational output of the students, this study established UDT in one of the schools in the Namobuddha locality.

Description of the study area

Access to safe water and sanitation are important foundations to ensure good hygiene. The valley floor is nourished by the river. However, water is scarce in the mountains. Thus, the school lacked basic water supply and proper sanitation

facilities which affected the quality of teaching and learning by adversely affecting participation through increased absenteeism due to poor health. A few local leaders and well-wishers of the school were looking forward to possibilities to enhance the quality of the school. Thus, this study was implemented in Janata Secondary School (pseudonym), located at the centre of the village in Kavre, east of Kathmandu valley. This study was carried out from 2019 to 2020.

Agriculture and animal husbandry are the main activities that sustain the life of the community there. The study area has high ridges with productive land. The total population of the municipality is around 29,519 where mostly Tamang, Newar, and Parbate people reside. The focus of the municipality is to support economic growth, environmental protection, education, agricultural outreach, and public health (Namobuddha Municipality, 2015).

Ethical considerations

Ethical permission was given by the Nepal Health Research Council (Reference number 1960, Registration number 733/2018), Government of Nepal, to conduct the research, which was done to ensure that the school community will not be harmed by this research. A memorandum of understanding was also obtained from the district office to conduct the research. The head teacher of the school was informed about the project. All the participants were informed about the purpose of the project, and consent was given by all the participants before conducting the research.

Intervention mapping

Handling of human excreta is complex as it involves social taboos and willingness to handle one's own excreta and that of others. To change the psychosocial behaviour of the individual as well as the community, stakeholders were motivated as well as informed about the importance of the urine. Studies indicate (Manandhar et al., 2004; Rajbhandari 2008) that the effectiveness of Ecosan may be limited without the participation of the local community which is needed in every step. Bartholomew et al. (2006) further explain that small changes in society result in more substantial changes in individual behaviour and intervention at any level can affect both individuals as well as the community and structural levels. Thus, the intervention was planned and implemented at the individual level, organizational level, and community level with equal participation of the stakeholders. One example of an effective intervention comes from a pilot study conducted in Siddhipur village of Lalitpur district where the authors emphasize the importance of empowering the participants by making them aware of nutrients in their own waste, developing entrepreneurship skills, and using indigenous style toilets (Manandhar et al., 2004).

The idea of involving the stakeholders of the school is to ensure ownership and transfer the knowledge generated in the school to the community, so that the community benefits from the project. Collective action involving the community can lead to sustainable management of local sanitation (Dickin et al., 2017). Thus, community members were involved in this study. The aim of

active participation of all the stakeholders is to empower them as change agents. Furthermore, active participation of the stakeholders in planning, advocating for Ecosan, and properly implementing Ecosan also fosters a feeling of ownership of the stakeholders to ensure sustainability of the toilet. Through proper planning (which was done by creating matrices as per the intervention mapping process), by motivating individuals (through intervention and connecting with curriculum), and making habitual use of UDT (bringing it to practice), this study brought about a transformation not only in the behaviour of the students but also within the education process. To achieve transformational change in students' education, UDT is linked with the curriculum. For instance, one of the components of urine, nitrogen, was related to the nitrogen cycle.

To ensure an effective implementation of UDT in the study school, intervention mapping was used as a framework to guide the process. A table was developed based on Bartholomew et al. (2006) and Kretschmann (2011), which is modified based on the needs of this study. Table 1 provides an overview of the details involved in each step.

Table 1 Overview of intervention mapping steps

Step 1	Conduct needs assessment	<ol style="list-style-type: none"> a. Based on field visits and objectives of the project b. Identification of the stakeholders c. Building relations among stakeholders d. Assessing capacity and resources
Step 2	Create matrices to map out factors affecting UDT acceptance	<ol style="list-style-type: none"> a. Expected to change in the individual, society, and community level b. Specify determinants <ol style="list-style-type: none"> I. Personal determinants (practice) II. External determinants c. Create matrices of change objectives for agents <ol style="list-style-type: none"> I. Student matrix II. Teacher matrix III. Community matrix (Kretschmann, 2011).
Step 3	Theory-based methods and practical strategies	<ol style="list-style-type: none"> a. Review of interventions b. Identify theoretically based methods of behaviour change c. Choose intervention method
Step 4	Intervention draft	<ol style="list-style-type: none"> a. Consult with participants and implementers b. Develop intervention scope, sequence, theme, and material lists c. Develop documents and protocols d. Review available materials e. Review intervention materials f. Pre-test intervention materials with target groups and implementers and oversee materials production

(Continued)

Table 1 Continued

Step 5	Adoption and implementation plan	<ol style="list-style-type: none"> a. Identify adopters or users and implementers b. Specify adoption, implementation, and sustainability of performance objectives c. Specify determinants and create matrices d. Select methods and strategies e. Design interventions to increase uptake of the intervention
Step 6	Evaluation plan	<ol style="list-style-type: none"> a. Describe the intervention b. Describe intervention outcomes c. Write questions based on matrix d. Write process questions e. Develop indicators and measures f. Specify evaluation design

Step 1: Conduct needs assessment

According to the intervention mapping process, the first step is to conduct the needs assessment. To identify the needs of the school community regarding sanitation and its effect on students' health and education, a baseline assessment was conducted that helped identify the existing condition of the toilets, students' health status, and status of students' hand washing practices. Four interviews, one with the head teacher and three with teachers (one female and two male teachers), and a focus group discussion with students (male and female students), teachers, and parents were conducted. This study is focused on a basic level school (Grade 1 to 8); therefore, surveys with students from grade four to eight were conducted. Through surveys, interviews, and focus group discussions, capacity and resources were assessed and a report called 'The Status and Needs Assessment on Schools' was developed that highlighted the need for hygienic sanitation in the school. During informal visits and conversations with the community members, they explained that they were aware of using animal excreta as fertilizer, but they had never used human excreta as fertilizer in the field. However, they were very enthusiastic to learn and use human urine in the field and learn to grow organically.

'The Status and Needs Assessment on Schools' report was used to assess the capacity and resources which highlighted that the school has nine toilets. When designing toilet facilities for schools in Nepal, the number of toilets to students ratio recommended by national planning is 1:50 (National Planning Commission et al., 2013; Pokhrel, 2013). As per the Department of Education guideline, this ratio is 1:50 (Department of Education, 2015). The ratio of toilets to students in the school is 1:22. Toilets that were recently built are in good condition, though it was observed that they remain locked most of the time. The old toilets were poorly maintained; faeces were visible in the toilet. The urine from these toilets was wasted, which is a good source of nitrogen and potassium. Two of the existing old toilets were remodelled into urine diversion toilets, one of which was for the girls and one for the boys.

Next, the research team identified the stakeholders within the school community with whom constructive relations were built. The stakeholders (students, teachers,

parents, members of the school management committee (SMC), and members of the parent-teacher association (PTA)) were engaged from planning phase to implementation phase to increase the acceptance of the UDT. Regular engagement and continuous dialogue with the stakeholders can eliminate issues and doubts about UDT and provide clear understanding on the proper use of UDT; Jerome (2017) identified regular communication as one of the reasons for the success of the intervention.

Step 2: Create matrices to map out factors affecting UDT acceptance

After identification of the needs of the school community for improved hygiene, and once the relevant literature was reviewed, matrices for UDT for teachers, students, and the community were developed. Establishment of the UDT may be a challenge where such toilets have never been used and the issue of proper use and maintenance cannot be ignored. According to Rajbhandari (2008), acceptance of Ecosan can be increased through a value-based water and sanitation educational programme. For instance, emphasizing the importance of proper hand washing and the importance of UDT adds value to the Ecosan.

To develop the matrices, performance objectives, personal determinants (attitudes, skills and self-efficacy, knowledge, and expected outcomes), and external determinants (social norms and barriers and resources) of the target group were identified. It is expected to bring about change in the behaviour that affects the livelihoods of the community for the betterment of the society or community (Kretschmann 2011) through a series of action plans. A shortened version of the urine diversion toilet matrix for students is provided in Table 2.

Step 3: Theory-based methods and practical strategies

According to social learning theory (Bandura, 1977), transformation of the behaviour (of using Ecosan) of the change agents occurs due to inner driving forces along with the external forces that act as determinants. First, the stakeholders of the UDT who were unaware of the benefits of the use of urine were informed about the hygiene issues related to unhygienic sanitation. Next, the stakeholders (teachers, students, and parents) were made aware of the advantages of the UDT and informed of the nutrients found in the urine. Construction of the Ecosan and action-oriented workshops to facilitate proper use of the Ecosan were chosen as an intervention in which all the participants were involved. However, according to Prochaska and Velicer (1997), simply performing the action of using the UDT is not sufficient to change the attitude of stakeholders. To bring about behavioural change in the students, the attitude of the students towards the proper use of UDT needs to be adjusted.

Step 4: Intervention draft

As much as the establishment of Ecosan in the school is important, sharing the knowledge about Ecosan, the technology behind it and its application in everyday life is equally important. For sharing knowledge on the principles of Ecosan, the

Table 2 Urine diversion toilet matrix for students

<i>Learning objectives</i>	<i>Performance objectives</i>	<i>Pros (perceived benefits)</i>	<i>Cons (perceived barriers)</i>	<i>Perceived social norms/ influences</i>	<i>Self-efficacy</i>	<i>Action plan</i>
Increase knowledge and understanding about UDT	Learn about toilets, their importance, and types (conventional, UDT, Ecosan). Familiarize with the rough sketch of the design/model of UDT	Understand origin/history of toilets and learn about open defecation. Learn about UDT and its design and share in community for common benefit.	No prior use of UDT. Students may feel unable to advocate UDT.	Social and cultural norms related to accessibility, construction, use, and management of toilet (especially UDT). Political and religious influence.	Knowledge of toilets and identifying their types. Understand the needs and importance of UDTs.	Students will learn about toilets, their types, uses, and share with others. Students will understand why open defecation is problematic. Students will understand the necessity of using the toilet. Students will understand the health hazards of not using toilets. Students will advocate the benefits of UDT. Understand the use of urine in the garden. Properly apply urine in the garden.
Learn appropriate way/method of using UDT	Learn do's/don'ts of toilet. Learn to teach others on the use of UDT.	Be able to use UDT properly. Be able to use urine in the field.	Not knowing the purpose and method of using the toilet. Lack budget to construct toilets. Lack access to a UDT.	Knowledge sharing and proper teaching and learning behaviour/attitudes. Monitoring by teachers and seniors.	Knowledge of proper use of UDT. Knowledge of urine as a resource. Knowledge of urine not to be mixed with faeces and water in UDT. Knowledge of the process of using and cleaning the toilet.	Students will understand the ways of using UDT. Students will learn the do's/don'ts and reason for using UDT. Students will advocate the method and also monitor the use of UDT. Students will know how to clean the toilets and keep them hygienic.

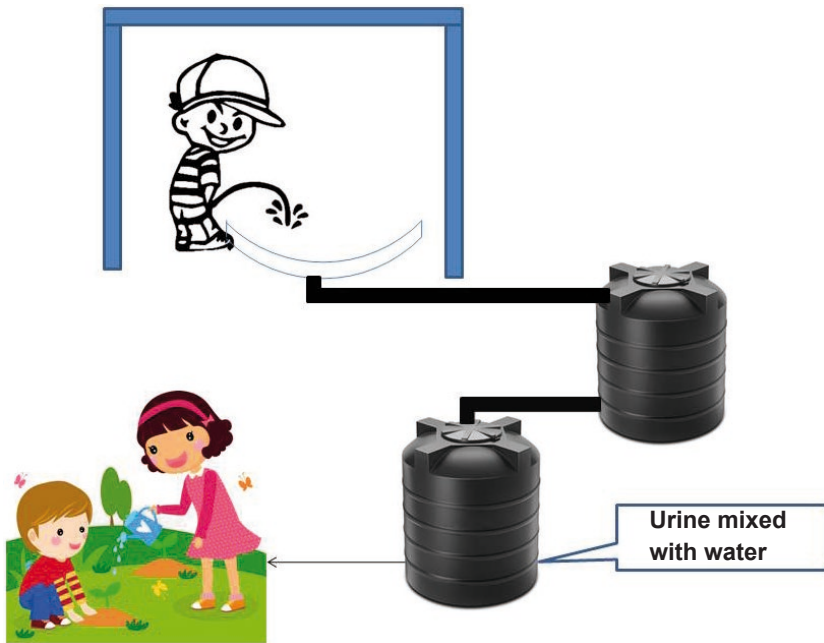


Figure 1 Sample of a poster developed by the research team to promote Ecosan

next step is drafting the intervention and curriculum for UDT. This step includes material collection and development: posters (shown in Figure 1), videos, curriculum development, teacher manual development, development of intervention training manual, and planning for conducting workshops with the teachers, students, and community (parents, members of SMC/PTA). Pradhan (2008) suggested the use of communication materials such as leaflets, brochures, videos, and audio for awareness and correct practice for urine diversion toilets. Some materials were collected from available sources and some were developed.

As well as learning about UDT and its management, the students also learned to use the urine in the garden. The urine was collected in a tank and it was diluted in another tank using wastewater. This diluted urine was used in the garden through the drip irrigation system. Through this activity the teachers were able to connect the use of urine with the curriculum.

Intervention materials were reviewed by implementers together with stakeholders to make changes as needed for the successful implementation of the intervention. Workshops were conducted with teachers, students, and the community separately as the objectives of the workshops for different groups were adjusted to the target audience.

Targeting different groups, it is necessary to prepare different strategies to implement the intervention. Workshops were facilitated to share knowledge on the importance of toilets, the concept of UDT, appropriate use of UDT, correct hand washing technique, awareness raising about the link between correct hand washing

and hygiene outcomes, and use of urine as a fertilizer with the predesigned curriculum. This was done while the construction of the UDT was going on, which means before the completion of the UDT, five to eight workshops were conducted with the teachers depending on the need. Panesar et al. (2006) also suggest integrating Ecosan within the curriculum. For example, hand washing was linked with personal hygiene. The teacher guide was the basis to provide the content to the teachers. During the workshop, the necessary changes in the teacher manual were discussed with the teachers so that the students could understand the concept of WASH, toilets, and UDT. After the workshops, teachers were involved in further lesson design for proper use of UDT and use of urine in the garden in their respective classrooms for different subjects. Thus, teachers were involved in the preparation of the teacher manual for using urine in the garden.

Teachers were provided with all the teaching materials (booklets, teacher manual, curriculum, posters, and videos) that they would need to convey the message of the workshop with the students. The intention of involving teachers in the workshop was to ensure equal participation of the teachers, share the responsibility, and develop the feeling of ownership of the intervention. For instance, Austin (2003) faced problems with ownership and maintenance of the toilet when the social aspects of the school and the community were not considered. To avoid such problems, after completing the workshops with the teachers, teachers along with the researchers facilitated the workshop for the students. At the end, a workshop with the community was held to disseminate the idea of UDT, use of urine as fertilizer, and to inform them about the project that the school is undergoing.

Step 5: Adoption and implementation plan

Some prerequisites that Kagawa et al. (2003) recommended for the successful adoption of Ecosan are: the planners and adopters should have full understanding of the basic principles of the operation and maintenance of the toilet; local condition and environment must be considered; and end users must be involved in the implementation and operation of the system. Considering the recommendations of Kagawa et al. (2003), an adoption, implementation, and sustainability plan was developed that involved three important components: adopters, implementers, and maintainers (Bartholomew et al., 2006).

In this intervention, users are students, teachers, staff, and parents who use the UDT, who are the adopters of the UDT as well. While planning and to include a divergent view, users who are 'for' as well as who are 'against' the intervention were included. The head teacher of the school, members of the SMC/PTA whose decision helped in the implementation of the UDT intervention were the implementers. For sustainability of the UDT intervention, maintenance and institutionalization of the intervention is necessary. The head teacher, some teachers, and some students were asked to be volunteers who would be responsible for the sustainability of the UDT.

During the adoption of UDT, different key stakeholders were involved. Adoption of UDT by the school does not guarantee proper implementation of the

intervention. Thus, for the implementation of the intervention (Table 1), proper planning needs to be done considering the adopters, the condition of the school, weather, timetable, and other components (Kretschmann, 2011) that might affect proper implementation of the UDT. Proper implementation results in ownership by the users which is essential for the sustainability of the UDT (Bartholomew et al., 2006). For effective adoption and sustainability of UDT in the school, implementation plans were developed considering personal and environmental determinants. The intervention mapping matrix presented above was created taking the determinants into account.

Methods and strategies that were applied for the success of the intervention were adopted from Bastien et al. (2015) as mentioned below:

- Develop awareness in the adopters (students, teachers, and parents) and implementers (head teacher, teachers, and SMC/PTA members) through videos, songs, hands-on activities, and workshops, and by linking the activities with the curriculum.
- Provide sessions to enhance the skills, attitude, self-efficacy through practical sessions, role play, presentation, and field visits.
- Provide information and hands-on activities that influence their behaviour change.
- Organize sessions for the community by involving teachers and students to diffuse the knowledge to the community.

Step 6: Evaluation plan

The final step of the intervention mapping is an evaluation plan, which is determined based on the previous steps to identify the loopholes in intervention mapping. This step helps identify whether the objectives of the intervention have been met; if the intervention is being implemented as intended; if the intervention is hindered; if so, what the causes of hindrances are; how the outcome can be improved; and how the intervention can be sustained in the long run. Based on the objectives of the intervention, the outcomes that this intervention expects to bring are change in behaviour and health outcomes, improved quality of life, and changes in educational outcomes. When the students regularly wash their hands, their behaviour changes, which ensures better health. When the students' health is improved, school absenteeism is reduced which improves their education.

The evaluation plan is intended to serve as a check to ensure that the intervention was adopted and implemented as it was intended. After checking the proper implementation of the intervention, change in knowledge and attitudes as well as behaviours will be evaluated; this will help us to understand the overall impact of the intervention. Thus, an evaluation plan includes some evaluation questions, designs, indicators, measures, time, resources, the way the data will be collected, analysed, and reported (Bartholomew et al., 2006; Kok and Mesters, 2011). Some of the questions that the evaluation plan addresses are 'Did the students' perception change on urine as waste?' 'How many students' knowledge, attitudes and practices have changed due to implementation of UDT in the school?'

To assess proper adoption, implementation, and sustainability, a survey, observation, focus group discussions, and interviews will be conducted after six months to one year of use of UDT. Besides the above-mentioned methods to check the evaluation, two specific indicators will be used: self-reported use (without additional verification) and confirmed use (evaluator observes or testifies) (Yates et al., 2018).

Overall reflection

During the implementation of the UDT, we encountered several challenges. The construction of the toilet took longer than expected which delayed the overall process. Besides that, the community had heard of using cow urine in the field as fertilizer but not human urine. At first, the students were hesitant to handle the urine. Furthermore, lack of knowledge and skills were another problem that teachers faced that introduced challenges in the proper implementation of the UDT. Moreover, contamination of the urine with faeces was a problem, which was similar to the challenges faced by Devkota et al. (2019). Furthermore, we discovered that it would have enhanced the implementation progress if there had been a lesson in each grade to connect Ecosan with the classroom. If there were one lesson in each grade, the teacher could easily connect it with their classroom.

Conclusions and implications

Intervention mapping is a time-consuming and iterative process that needs inputs from different stakeholders for it to be implemented effectively in the field. Based on our experience, intervention mapping provides a systematic framework that aims at making the intervention successful through careful planning and the application of theory to bring about change in the key behavioural determinants and also in education.

Intervention mapping was an important framework to ensure successful implementation of UDT in the school. For proper adoption and sustainability of the UDT, it is essential to engage local stakeholders from the initial stage. Theory-based intervention such as following the steps of Bartholomew et al. (2006) for intervention mapping provided guidance for transforming knowledge, attitude, and practice at individual level and community level. Transformation in knowledge was achieved by linking UDT with education; change in attitude was possible through motivation and providing knowledge through workshops; and change in practice was possible through regular use of UDT.

This study recommends establishing a school garden for the use of urine from the UDT which can play a role in supporting local and contextualized teaching and learning. Even though there is a need to change the curriculum based on the needs of the local context, the textbooks in the whole country are the same and not adapted to the different settings in Nepal. The curriculum is not contextualized and

practical enough to capture the needs of the local context. Thus, this project recommends linking Ecosan and school gardens such that they can be used as a living lab for student learning, and integrating the concept of Ecosan within the curriculum to support local and contextualized teaching-learning.

Furthermore, this study also recommends shifting the sanitation paradigm towards sustainable sanitation by informing government and policy makers. Adoption of UDT in urban schools can be difficult due to lack of space. However, the context of public schools in rural and remote areas is different. The toilets are usually outside and it is not very costly to remodel them and shift the sanitation to sustainable sanitation. Furthermore, the government has already initiated its 'One school: One garden' policy; this study recommends that the government makes a shift in the sanitation paradigm.

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