



Everyone can grow!
A curriculum to bring
nature indoors

By: T. Rachel Elam

Everyone can Grow!

Table of Contents

Table of Contents	2
About the author.....	4
Acknowledgements	5
A letter about this curriculum.....	6
Background.....	7
What is environmental education?.....	7
What is horticulture therapy?	7
What is peer support?	8
How to set up a peer supportive and positive atmosphere in the classroom.....	9
Benefits of indoor gardening.....	11
Who this curriculum will reach	12
Examples for implementation.....	13
How to use the modules and lessons:.....	13
One-shot workshops.....	14
30-minute ideas:.....	14
1-hour ideas:.....	14
2-hour ideas.....	14
(3-hour block lessons) 5-day vivarium intensive:	15
Examples for evaluations.....	17
Overall program evaluation	17
Evaluation for one-shot workshops and intensives.....	18
Module 1: Botany Made Simple.....	19
1.1: Overview of botany terminology	19
1.1.1 Parts of a flower.....	20
1.1.2 Types of fruit	21
1.2: Plant identification	23
1.2.1: Plant identification vocabulary	24
1.2.2: How to use a dichotomous key	24
1.3: Plant cells and their parts.....	26
1.4: Photosynthesis and the importance of the colors of light	27
1.5: The life cycles of plants	29
Module 2: The basics of indoor gardening	31
2.1: Selecting lights for indoor gardening	31
2.1.1: Light vocabulary.....	32
2.2: Soil basics.....	33
2.3: Caring for plants	35
2.4: Growing sprouts and microgreens.....	36

Everyone can Grow!

2.5: Growing oyster mushrooms	38
2.6: Building a basic hydroponic or aquaponics set up	39
2.7: Building an indoor composting worm bin	40
2.8: Common pests, diseases, and remedies	42
Module 3: Building an indoor ecosystem	44
3.1: Ecology of vivariums.....	44
3.2: Terrariums and vivariums	46
3.2.1 Basics of building a terrarium or vivarium	47
3.4: Aquariums	49
3.5: Maintenance crews.....	51
3.5.1: Raising and breeding cockroaches	51
3.5.2: Raising and breeding crickets.....	53
3.5.3: Raising and breeding isopods	53
3.5.4: Raising and breeding springtails	54
3.5.5: Raising and breeding worms.....	55
Module 4: Plants and art!	56
4.1: Monographing and plant journaling	56
4.2: Herbariums.....	57
4.2.1: Building a plant press	59
4.2.2: Mounting an herbarium sample	60
4.3: Pressed plant art	61
4.3.1 Pressed plant paper.....	62
4.3.2 Pressed plant bookmark	62
4.3.3 Pressed plant portrait.....	63
4.4: Making a mixed plant planter	64
4.5: Making concrete planters.....	66
4.5.1: Scrap cloth planters	66
4.5.2: Concrete and coco fiber pots.....	67

Everyone can Grow!

About the author

Hi, my name is Rachel and I am a student for life. Learning is a way to keep life interesting and filled with purpose. I have used my personal experiences and interest in the world around me as my guide to write this curriculum and it is my hope and joy to share it with you. I am a U.S. Operation Iraqi Freedom veteran who was injured in the line of duty. It changed my life and my perceptions of the world. I felt the need to get back to my roots, which in my case are literal as I was homeschooled by my father out on a 5-acre hobby farm in the middle of nowhere, Arkansas. It was out on this little piece of swamp bottom where I learned just how rich an ecosystem can be and I was free to roam its wonders. Who wouldn't want to go back to that?! I sure do, but the saddest part of life is the same as the happiest. Things change. I got injured, and now due to my disabilities I can't do outdoor gardening as I once did. The nice thing is, you can't stop someone with energy of their conviction and now I have found a love of gardening indoors that I hope to share with all of you.

Whether or not you have ever taught anything in an official or unofficial capacity, I want you to know that you can teach. If you have ever told a story, or explained a concept to someone, congrats, you taught a lesson! Not that you need my permission, but go right ahead and skip around this curriculum, do what works for your group, your level, and what you want. Be free. That being said, how you use this curriculum is largely up to your interpretation. All I would suggest is that if you are a beginner or feeling a bit rusty, please read the teacher's notes for each lesson to help you get in the right mindset, see some fun facts, and other neat stuff to share when you do your thing.

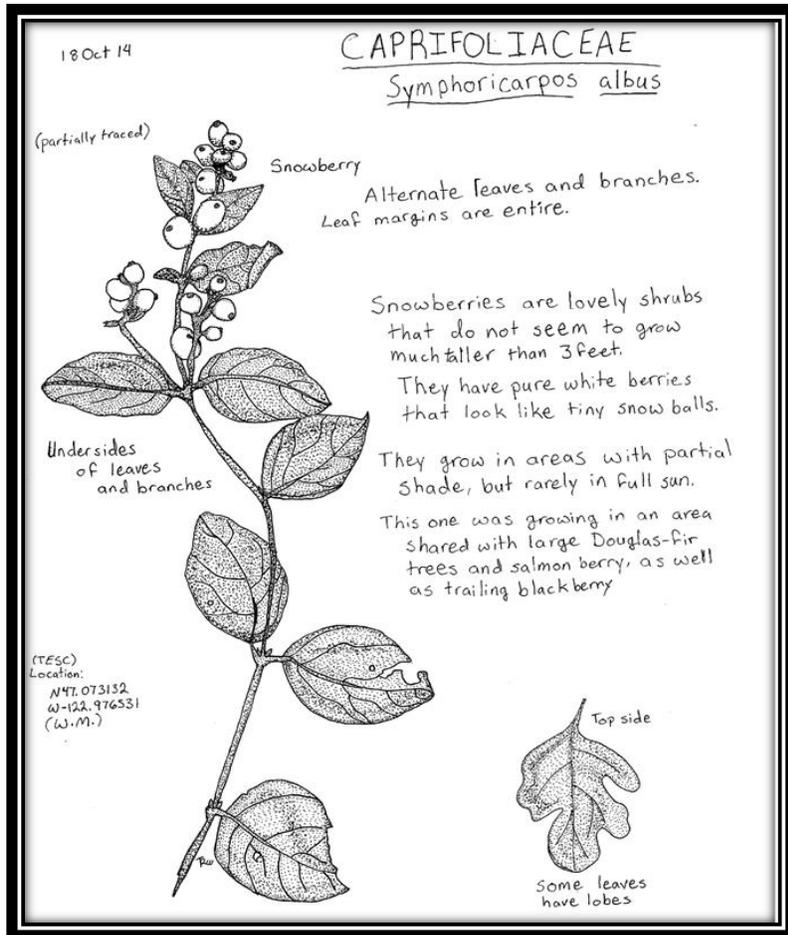
To contact the author please email her at: everyonechangrow@gmail.com

Everyone can Grow!

Acknowledgements

First, it is important to thank God for making this time available for me to take a risk and do something I never thought I could.

Second, I have to thank my wonderful family: My father, James, my mother, Nancy, and my big sister Melody. Without all of you, I wouldn't be here. Your support is the most wonderful part of my life and I love you all.



Third, I can't thank my instructors enough at Western Washington University for their above and beyond support of my work. I would like to personally thank my advisor and professor, Dr. Gene Myers, for his amazing support during my best of times and worst of times, Dr. Gigi Berardi who pushed me beyond myself to learn and do more, and Dr. Nick Stanger for helping me think in ways I never knew existed so I can be more appreciative of the beautiful variety of others.

Finally, thank you to all my peers who helped me along the way. Special thanks to Hannah Burch and Toby Una for helping with a couple lessons in Module 2. You are both wonderful and a true blessing to have had to work with.

Everyone can Grow!

A letter about this curriculum

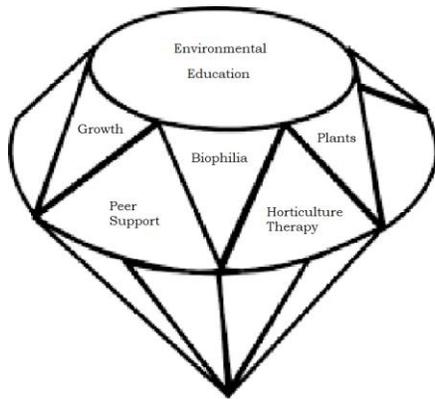
Hello and welcome to *Everyone can grow!* If you are reading this, then you must have some interest in growing plants indoors as a community building and therapeutic activity. I couldn't agree more! Starting with making the home a peaceful place, building a community of support, and breaking down the artificial walls between humans and nature makes sense to me. The nice thing about being inside is it allows everyone to participate, regardless of personal skill level, ability, or experience. This curriculum specifically focuses on veterans of all kinds, from the many generations, wars, and discharges, as well as other highly supportive roles such as being a military spouse and those who grew up in military households. There are a lot of ways to grow plants and a lot of ways to grow community. Many times, it comes down to trial and error. This text is only showing one way to do things. New and better methods and techniques are always possible so do some experimenting and find out what works best for your circumstances.

So why use this particular curriculum? To possibly oversimplify a complex problem, this text intends to support the reintegration of veteran populations into civilian life while connecting them with peer support through horticulture therapy and encouraging environmentally responsible practices. For this to work, this curriculum must be read with a peer supportive mindset (Brown, Besterman-Dahan, Chavez, Njoh, & Smith, 2016). Veterans, from my experience have been a more supportive and kinder community than soldiers in the military. It is from this that I hope even those who did not have camaraderie in the military can find it now and begin down the path to heal the wounds left by their service. This curriculum encourages forming mixed veteran and civilian communities around indoor gardening as a way to engage veterans to connect to others over common (and hopefully fun) ground.

There is a gap between being a soldier and transitioning to civilian life (Brown, Besterman-Dahan, Chavez, Njoh, & Smith, 2016) and it is the hope of this curriculum to suggest some group activities and help fill part of that gap by helping transitioning soldiers, veterans, and their families in finding purpose, building communities, and forging new relationships while shifting back into civilian life after military service. This process is not an easy one, nor do I wish to claim that it is possible to fully transition out of the military mindset. What is true however, is that veterans have the capacity to integrate in a way that allows them to develop interpersonal skills and do what they do best, serve. Whether they are serving themselves in a therapeutic way, their families, or their community, this curriculum is designed to help veterans have multiple connection points to others of similar interests to connect to their new unit; civilian society. This system is meant to be as modular as possible with a variety of activity types, so instructors can

Everyone can Grow!

pick what is most interesting and appropriate for their group while making a fun time of teaching others. Every lesson has built-in peer support elements to help participants fully appreciate nature and experience personal reflection along the way. Learning is an exciting adventure so let's get started!



Background

This curriculum is a culmination of several facets from different modes of study. It brings together the idea of biophilia, horticultural therapy, and peer support, and focuses it all through an environmental education lens.

What is environmental education?

The short answer to this question is that environmental education is any education that raises awareness and motivation to take a stand on environmental issues. It can be as simple as taking responsibility to pick up trash, or as big as becoming a political activist fighting to eliminate the dependence on fossil fuels. Some of the best ways to attract more people to care about their environment is to show them its beauty and help students connect the degradation of the environment with the loss of such wonders. Not everyone has to go out and become an environmental hero, even at home, things are connected in various ways. Every action changes another factor in those connections in either good, bad, or neutral ways, so every lifestyle and every life makes an impact. The more we know, the more we can ensure a prosperous future.

What is horticulture therapy?

This is a relatively new term that is used to describe any type of plant-based therapy program. It is typically administered by a licensed therapist, but that is not the only way it can be done. The main goals of horticulture therapy are the gaining of new skills and the reduction of negative symptoms from various mental and physical diseases. Since most teachers of this curriculum may not be licensed therapists, this term is used broadly to describe the intrinsic benefits of caring for plants, such as peace of mind, more positive mental attitude, and an increase in pain tolerance (Bringslimark, Hartig, & Patil, 2009).

Everyone can Grow!

What is peer support?

Peer Specialists Do	Peer Specialists Don't
Present themselves as someone with personal experience of having a clinical problem and experience using treatment to successfully manage or cope with that problem.	Present themselves as something other than a Peer Specialist. They do not hide their role as a Peer or their past experience when it would be helpful to those they are working with.
Provide support and guidance to others trying to deal with a clinical problem.	Provide formal psychotherapy or any other specific clinical service outside their scope of practice or their skills.
Talk about their experiences in a way that helps others successfully use treatments and self-help strategies to recover from their problems.	Talk about their experiences or themselves in a way that is not helpful or distracts from the needs of the person they are serving.

(The peer role, Drebing, 2016)

According to Christina Wolf (2018) in her Peer Support training manual, "Peer support is when people who have been through a similar life experience provide knowledge; experience; social, emotional, and/or practical help to each other." This is especially prudent in veteran populations where experiences may be highly sensitive and traumatic to the individual. Practicing peer support does not need to be perfect, it simply needs to be genuine. Sometimes all people need is for someone else to say hello and show them that they are welcome. There are three main parts to peer support: social, practical, and emotional. Social peer support is simply having a place where they can connect to other people. Practical peer support is helping someone with an issue, like giving them a ride or helping them with their garden. Emotional peer support is the most complex and this curriculum cautions people to be careful with its use. It is best to have training before fully including this into a program. The most important part of peer support according to Wolf (2018), is the mindset of; presence, empathy, and curiosity.

- Presence: The act of giving another person your complete attention, while remaining open-minded and non-judgmental.
- Empathy: The ability to recognize and care about the feelings of another person.

Everyone can Grow!

“When you plant lettuce, if it does not grow well, you don’t blame the lettuce. You look for reasons it is not doing well. It may need fertilizer, or more water, or less sun. You never blame the lettuce. Yet, if we have problems friends or family, we blame the other person. But if we know how to take care of them, they will grow well, like the lettuce. Blaming has no positive effect at all, nor does trying to persuade using reason and argument. This is my experience. No blame, no reasoning, no argument, just understanding. If you understand, and you show that you understand, you can love, and the situation will change.” – Thich Nhat Hanh

- Curiosity: The sincere desire to learn more about another person, without an agenda of your own.

How to set up a peer supportive and positive atmosphere in the classroom

Perhaps more important in some ways than what is being taught is how it is being taught. In the instance of using plants as a social connection and as a therapeutic activity, it is imperative to ensure a positive and supportive

atmosphere for students. This can be as simple as setting up solo work stations where people can go and work on activities at their own pace while asking for assistance as desired, to more organized classes that have group work involved. Leaving the option open for how people choose whether or not express themselves in the classroom is an important part of giving freedom of choice to those who need it. This curriculum is meant for people of all teaching experiences, so an explanation of how to set up a classroom may be useful for some teachers. Understanding and implementing peer support does not need to be complicated, although it may be complex.

There are many ways to set up a positive space for students. Below is a check list to help inexperienced teachers set up a good, clean and positive environment for students.

- **Consistency is crucial** for a peer supportive atmosphere (Drebing, 2016).
 - Be predictable and on time.
 - Arrive earlier than may seem necessary.
 - Plan. Make lists for what tools and items you will need and really think through the details. This will help prevent situations where the activities cannot be completed.
- Think about how to create an accepting and comfortable atmosphere while setting up the room. **Give yourself time to set up**, arrange furniture, and get ready to share your lesson (Drebing, 2016).
 - **Lay down rules of conduct** and ensure that rudeness is not tolerated. Allow the group to have input on what should and should not be allowed

Everyone can Grow!

during the lesson. (Remember that veterans have their own culture and that culture may seem crude to civilians.)

Some universal ground rules:

- Be respectful to everyone
- No personal attacks
- Disagreements are OK but respect the person
- Avoid interpreting others' feelings
- Speak for yourself
- No cross-talking, no sidebar conversations
- Try not to interpret; try not to talk so long that others will feel a need to interrupt you
- Meetings will start and end on time
- Respect physical boundaries – don't hug or touch without asking permission first
- Try to avoid talking about your religious or political views in a way that may make others uncomfortable; no proselytizing
- Everyone's cellphones should be silenced
- If attendees need to leave early, they should do so without disrupting the meeting

(Goals and comfort agreements, Drebing, 2016)

- **Be empathetic and caring.** Be aware of the mood in the room and adjust as necessary to keep the class flowing.
- **Be patient** and empathize with students. Allow them to set the pace where possible.
- **Encourage students** to work together and help each other, but do not force interaction if someone seems to want to be alone. Take baby steps here, be gentle. Just ask.
- Remember that these are military veterans, so they might have what may be considered a cruder way of speaking and may say inappropriate things. **Be patient** and let things go unless it seems to be making the group uncomfortable. If having families or children present at the lessons, it may be prudent to lay down rules of language and content.
- **Practice** the lesson beforehand, even to yourself. This can really help you visualize how to teach and what you will need to have available.
- **Customize lessons** with whatever interests you or with things you know. Do your own research if necessary, the handouts are just there to guide you, they are not law.

Everyone can Grow!

- Share the burden of leadership: Don't use "I" statements, say "the class" or "us". Phrase things of as questions, **ask** the class what they want and **don't make demands**.
- Remember that everyone has their own likes, dislikes, and learns differently. Adjust when things don't seem to be working out. **You can do this!**

For more detailed information, please read:

Leading Peer Support and Self-Help Groups by: Charles Drebing, PhD, 2016

The Peer Specialist Pocket Resource for Mental Substance Use Services by: Charles Drebing, PhD, 2016

To learn more about peer support training from Growing Veterans contact: irwin@growingveterans.org

Benefits of indoor gardening

Keeping plants indoors has many benefits, some are studied, and some are claimed and assumed. Remember that for things to be psychologically beneficial there needs only be a perception of benefit, regardless of physiological proof. However, there are increasing studies in this area and more benefits are being studied in scientific detail. For the purposes of this curriculum, benefits will be separated into psychological, physiological, and environmental. Something to note about the studies done on the effects of plants on people is that they are heterogeneous, meaning that conclusions are more difficult to generalize (Bringslimark, Hartig, & Patil, 2009).

The most common psychological benefits cited in literature are reductions in stress and an increase in focus (Bringslimark, Hartig, & Patil, 2009; Lohr, 2010; Lee, Lee, Park, & Miyazaki, 2015; Lohr, Pearson-Mims, & Goodwin, n.d.). These benefits were found to occur when plants were within the same space as the person or people being studied, such as on a nearby desk. Most were presence or absence studies so they did not consider having artificial plants nearby. Although another study by Lee et al., (2013) showed that there is a difference between people working with artificial plants versus real plants. They found that people making artificial plant arrangements did not receive the same reduction of stress and a sense of enjoyment as those who repotted living plants. It is from this reduction in stress that some claim that plants improve happiness, creativity, and mental health (Borkan, 2015). A study done on

Everyone can Grow!

post-operative patients showed that having plants in their rooms improved their perceptions of their rooms and care which contributed to faster recoveries when compared to patients without plants in their rooms (Park and Mattson, 2009).

Along with the psychological benefits of having plants in the same room as people, there are also physiological benefits, such as increased pain tolerance (Bringslimark, Hartig, & Patil, 2009), improved recovery from illness (Park and Matteson, 2009), lowered heart rates and blood pressure through physically working with plants, such as repotting them, (Lee et al., 2013; Lee, Lee, Park, & Miyazaki, 2015), and even claims of improved sleep through the improvement of air quality (Leonard, 2015).

Plants also have an effect on air purification. According to Dela Cruz, Christensen, Thomsen, & Müller (2014), plants remove 59 different volatile organic compounds from the air, such as formaldehyde, carbon monoxide, carbon dioxide, and benzene. There is also a claim that plants can negate cigarette smoke, although too much cigarette smoke may also clog the stomata of the leaves, harming the plants as well (Berkowitz, n.d.; Nosowitz, n.d.; Staff, 2015). There is also a growing trend in using plants to reduce road noise, lower interior air temperatures, balance humidity, and decrease dust (Borkan, 2015; Tomlinson, 2018).

With all these wonderfully positive effects, who wouldn't want to keep a few plants around?

Who this curriculum will reach

This curriculum means to reach both veterans and their families in a way that connects them to civilian populations. Soldiers are not trained to trust their surroundings. From my experience we are trained to focus on the missions given and get the job done, regardless of personal consequences. This includes, of course, up to losing your life in the line of duty. There is strict structure and chains of command to be obeyed. This may lead to some of the challenges soldiers have when transitioning into the life of a veteran outside of that culture.

There are several generations of living veterans these days and each one has its own customs, culture, and ways to be respected. This presents a conundrum for an inclusive educator. How can there be one way to connect several generations of war veterans with non-war veterans and civilians? The answer may shock you, there is no "one" way, but instead a

Everyone can Grow!

modular, moldable system that can be adapted to the population present in order to best serve their individual needs.

Some veterans will be reserved and need time to work alone, others will be looking for someone to talk to and need someone to listen actively to their stories, while others will be there just for the camaraderie of like-experienced people. The list is nearly endless. Whatever the reason a veteran wishes to leave their personal space to get involved, all of them deserve to be a part of the program. There are populations of veterans out there who are unhappy with their service and may not have ever felt camaraderie while in the service, and there are also those who never deployed to war or who didn't volunteer to join and were drafted into service. This does not make these people any less of a veteran and this curriculum hopes to encourage them to get involved as well.

Examples for implementation

How to use the modules and lessons:

Each module has several lessons, some lessons have several activities. This is so instructors can mix and match activities based on their needs to make this curriculum as modular as possible. An example of how to use a lesson from a module would be to start with the main lesson plan such as *1.1: Overview of botany* and then choose one, or both activities *1.1.1: Parts of flowers* and/or *1.1.2: Types of fruit* to accompany it. Without the activities, lessons will be simple lectures, which might be all that is needed depending on the situation. This work is meant to bring interested parties together to learn more about plants, share activities and experiences, and build up a community in the process. Adding potlucks, discussion time, and other forms of social interaction after the lessons is exactly what this curriculum hopes to achieve. Because of this, it is advisable to allow more time than the just the lesson will require, that way people can have their chance to make connections.

Besides using this curriculum linearly as it was written or breaking it into mix-matched one-shot lessons, below are some basic suggestions for how to implement this curriculum. included is a simple 5-day vivarium intensive, where participants learn about plants and ecosystems while building a vivarium. There is also an example calendar with a month of lessons, where participants have more time to leisurely move through the curriculum and the lessons can be much shorter depending on time constraints. It is my personal vision for outdoor programs to use this as a winter curriculum to have continued contact with their participants regardless of the weather or the stage of the growing season. Please use this curriculum to keep

Everyone can Grow!

up the passion and community building that happens with summer activities, and be totally inclusive regardless of ability/disability, age, or experience.

One-shot workshops

It may be the most useful for some organizations to combine a few lessons into a single workshop. This is simple to do and requires choosing two to three lessons to combine with an activity added to the end. Each lesson in this book is meant to last about 15 minutes, so keep that in mind when combining lessons. For example:

30-minute ideas:

- To give a thorough introduction to how light affects plants combine lessons: 1.4 and 2.1.
- Without an activity, learning about clean-up crews can be a short lesson. Demonstrating how to build a basic set up of springtails or isopods can help students understand how simple keeping these animals can be. Combine all sub-lessons of 3.5. (This may sound like a lot, but most clean-up crew species have similar maintenance.)

1-hour ideas:

- A good start for a practical one-shot would be to combine the basic lesson on lighting, soils, and basic care for plants. Adding a plant repotting activity to the end can really bring all the parts together. Combine lessons: 2.1, 2.2, and 2.3.
- For a more scientific approach, combining the basic botany lessons as one big workshop could be a wonderful way to introduce a lot of knowledge all at once while having a few fun activities to do such as dissecting flowers and naming fruit. Combine lessons: 1.1, 1.2, and 1.3.
- An artistic idea would be to make concrete planters. A combination of the 4.5 lessons would go fairly quickly with the only caveat being that they would have to return to pick up their cured planters.
- Giving an hour to learn about dichotomous keys and practice keying out plants is another good use of time for beginners. Combine the sub-lessons in 1.2.

2-hour ideas

- To fill a longer block of time, one of the simplest ways is art. Combine lessons building a plant press with monographing and plant journaling with time to complete a page in their plant journals and this lesson could go on for quite a

Everyone can Grow!

while. Allowing students to go outside and collect a sample of a plant to draw, and then giving them the option to press their specimen.

- For an artistic project, making pressed plant paper or bookmark

(3-hour block lessons) 5-day vivarium intensive:

Day 1: There is a lot of preparation work needed to build a vivarium, make sure you have pre-gathered the necessary tools and supplies beforehand. Start with the *Building a background* part of the *Lesson 3.2: Terrariums and vivariums* handout. While the background is curing begin *Lesson 1.2.2: How to use a dichotomous key*, this can be done concurrently since it takes 24 hours for the foam to cure. Now you've learned how to begin a vivarium and how to use a dichotomous key. If students do well and there is still time, run through *Lesson 1.1.1: Overview of botany terminology* with them. Be sure to have all necessary handouts and supplies ready before the class begins.

Day 2: Carving the foam takes time. Some people will feel great about their work after carving for about 30 minutes, others may need more than the 3-hour block. Let the class decide what is needed and give the quicker students more to do by offering a lesson in lighting (2.1.1) using the *Light sources* handout. Light vocabulary can be a bit confusing to understand so this might take a while or go quickly depending on your students. For the students that might not be interested or are on the extreme side of quickness, ask them to work with their *Illustrated guide to plant vocabulary* handout and try drawing and labeling leaves. This will blend nicely into a lesson about monographing and keeping a plant journal (4.1).

Day 3: Give students more time to carve their backdrops if needed, the ones who are ready can move onto the silicone step. Make sure to have either dry soil mixes ready or dry soil ingredients in accordance with the handout. This takes some time and make sure to have disposable gloves! It is not good to be touching the foam or the silicone and getting it off is difficult. Since it takes 24 hours for silicone to cure for the next step, have the students learn more about soils with *Lesson 2.2: Soil basics*. This way they will be more prepared with the next step of building a false bottom if they chose to build a tropical vivarium. Try to get all backdrops finished and curing for the next step if possible.

Day: 4: Now that the backdrop is finished, the bottom does not take much time at all, so there is more time for general instruction. *Lesson 3.1 Ecology of vivariums* is a great lesson for this time space, since all that is left is adding a false bottom and planting the terrarium. For those who are extra studious, give them a lesson on the clean-up crews with *Lesson 3.5: Maintenance crews*.

Everyone can Grow!

Day 5: This day is for more lessons and to help slower students have the time they need to finish their vivariums. Let them set the pace and choose what interests them. Have handouts ready and be sure to have reviewed as much as possible. Direct students to the various lessons that have been previously covered and reiterate them as needed. For example, if students wish to practice monographing, allow them the space to do so, and if they missed the lesson on lights, help guide them through it. Use the student body present as the guide for what is most needed.

Example of a monthly lesson calendar

Example month of lessons						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Building a terrarium/vivarium workshop	Basics of indoor gardening and clean-up crews (CUC)	Botany made simple	Building a terrarium/vivarium workshop	Art day! Nature journaling and plant I.D.	In depth plant care	Arts and crafts
3.1: Vivarium ecosystems	2.5: Indoor composting with worm bins	1.2: Plant I.D.	3.1: Vivarium ecosystems	4.1 & 1.2.2: Plant journaling & dichotomous keys	2.3: Caring for plants with focus on low to high light plants	4.3: Pressed plant art
3.2: [Part 1] Building a viv/ter	3.5: Maintenance crews (CUC)	1.3 & 1.4: Cells & Photosynthesis	3.2: [Part 1] Building a viv/ter	4.1 & 1.2.2: Plant journaling & dichotomous keys	2.3: Caring for plants with focus on crop plants	4.5: Making concrete planters
3.2: [Part 2] Building a viv/ter	2.1 & 2.2: Lights and soil	1.1 & 1.5: Botany terms & life cycles	3.2: [Part 2] Building a viv/ter	4.1 & 1.2.2: Plant journaling & dichotomous keys	3.4: Aquariums: Keeping fish naturally	4.4 & 2.3: Making mix plant planters & caring for plants
3.2: [Part 3] Building a viv/ter	Maintenance crews (CUC)	4.2 & 4.2.1: Herbariums and making a leaf press	3.2: [Part 3] Building a viv/ter	4.1 & 1.2.2: Plant journaling & dichotomous keys	2.1 & 2.2: Lights and soil	4.2 & 4.2.2: Herbariums and mounting an herbarium sample

These lessons can be ordered in a multitude of ways. Many can be layered so that workshops can be “open” or allow students to choose their crafts as they see fit which may help

Everyone can Grow!

attract more people per workshop. In this way, the instructor is more of a moderator and not necessarily there to directly teach unless students have specific desires to learn. Having a central theme to a day and then allowing the flexibility for people to do what they like is arguably the best way to get the most participation. In this way, those who need the structure of a class will have it, but those who wish to be near, and need their autonomy can be accommodated as well.

Examples for evaluations

Overall program evaluation

Use entry and exit surveys to get an idea of how students react to the lessons. This way they can be more easily tailored to the specific community present. Having open meetings on how to use the lessons and community input are as important as the lessons themselves. This curriculum is meant to help form stronger community bonds as well as form new bonds between people. Since this curriculum is meant as a way to self-care, receive peer-support, and get involved, it is important to capture these aspects with any evaluation methods used. For example:

Example entry questions:

- How much experience do you have caring for houseplants and animals?
- What might you hope to gain from taking a workshop on keeping indoor plants?
- What kinds of plants are interesting to you?

Example exit questions:

- What did you like about the lesson?
- What did you not like about the lesson?
- What could be improved or done differently?
- How did you feel about working in groups or with other students?
- Do you think you will keep in touch with your classmates?
- How likely are you to return to learn more?

A quarterly and even a yearly review should also be conducted to ensure that the program is being received well and that objectives are being met. These objectives are ultimately up to the organization using this curriculum, but some suggestions are:

- An increase in new participation from veterans and their families.
- An increase in returning participants.

Everyone can Grow!

- If conducting studies of the mental health of participants, finding that workshops lower perceived negative symptoms is something to assess.
 - Stress
 - Depression
 - Anxiety
 - Pain
- Ask about any challenges they might have faced caring for their vivarium.
- Ask about how they feel about having a vivarium in their homes.
 - Less stress?
 - More calm?
 - Feelings of psychological escape, relief, peace?
 - Feelings of care, concern, pride, accomplishment, worry?
 - No changes?

Evaluation for one-shot workshops and intensives

Evaluations for one-shots can be as simple as a 10-minute focus group at the end of the class. This is important to ensure that students feel that they benefited from the class and can help with overall program improvement.

Begin the focus group by introducing the questions, such as saying: “Thank you for participating in this workshop session. I appreciate each of you for taking out time to be here. I would like to ask a few questions about the session and how you are feeling in relation to how you felt before the session. The questions are arranged much like an after-action review since we are all familiar with that type of survey.”

Example focus group questions:

- What did you like about the class?
- What did you not like?
- What could have been done differently?
- Will you be attending the rest of the sessions? Why or why not?
- How do you feel now in relation to how you felt when you started the session?
- What would you say are the main benefits you experienced from the workshop?

Everyone can Grow!

Module 1: Botany Made Simple

Why start with science, that all too complicated mess of craziness that many people won't remember much of except perhaps that "the mitochondria is the powerhouse of the cell"? Well you aren't wrong, you don't need science to grow a plant. They are going to grow regardless of what you do or do not know about their processes. The nice part about learning botany is that it helps with plant identification. Also, by understanding the basics about plants, you can make better decisions about resources like light, soil, fertilizer, etc. It all comes back to science in the end, so let's learn a bit now and just get it out of the way.

1.1: Overview of botany terminology

Teacher's notes: Understanding botany is arguably unnecessary to grow plants, however, it is nice to learn because it gives a deeper appreciation for plants and sometimes even helps people understand why plants do what they do. An example of a fun botany fact is that most plants we bake with are monocots, meaning they have a single cotyledon or "seed leaf", which is the first little bit of green you see when a plant germinates. Monocots we bake with include: flour (ground seeds), sugar (refined pulp), and even vanilla (which is the fermented and cured seeds and pods of an orchid)! Isn't that interesting? There are a lot of interesting and sometimes downright amazing things that science has uncovered about plants. Even down to the simplest processes. However, to understand these cool facts, there must be some commitment to learning a whole new vocabulary.

Objectives:

- Understand basic botany.
 - Understand proper vocabulary.
 - Identify parts of a plant.
 - Identify parts of a flower.
 - Identify different types of fruit.

Methods: Use the *Basic botany* handout to help students learn more about botany and its terminology.

Background: Although not expressly necessary to growing plants, understanding basic botany terms can be an interesting way to look deeper at the world around you.

Procedure:

- Print enough handouts for the proposed number of students.

Everyone can Grow!

- Review all material before the lesson.
 - It is impossible to fully understand botany in a day, but it is possible to become familiar with it in a day.
- Teach from the handout and explain the terms.
- OPTIONAL: Use Everet, Eichhorn, and Raven, *Biology of plants* (2013) *Chapter 3: The plant cell and the cell cycle*, the diagram on pgs. 406-407, pgs. 410-411, pgs. 422-423, pgs. 426-427, pgs. 442, 443, and pgs. 472-473.
- The first part is all vocabulary, so there isn't much to do besides review it.

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Did you learn anything new during this lesson?
- Was anything surprising about the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

1.1.1 Parts of a flower

Teacher's notes: This activity is a fun, hands-on way to learn the parts of a flower. It would be best to review the *Basic botany* handout, specifically the part about flowers.

Methods: Flower dissection activity, drawing flowers, naming and identifying flower parts, references to the *Basic botany* handout.

Objective:

- Identify the parts of flowers and their functions.
- Understand plant reproduction.

Background:

This is a common activity used for all age groups from elementary to college. It provides students with a kinesthetic approach to learning the parts of the flower. By drawing the flowers, visual learning is also used. If students are in groups and allowed to have a discussion and practice naming the parts between them, it engages aural learning as well making this a highly inclusive way to teach this subject.

Materials:

- *Basic botany* handout.

Everyone can Grow!

- Peruvian lilies work best as an example of a perfect flower.
- Any flower from the aster family, including sunflowers and dandelions are great example of composite flowers.
- Any number of other kinds of flowers that are readily available will work.
- Note writing and artistic materials: Paper, pencils, pens, watercolors, etc.
- OPTIONAL: Jewelers lupe or magnifying glass.
- OPTIONAL: Dissection kit with precision knife.
- OPTIONAL: Local flowers based on seasonality. WARNING: Local flowers may require additional preparation by the instructor to identify the parts before their use.

Procedure:

- Print enough handouts for the proposed number of students.
- Set up the classroom with plenty of workspace for either single students or groups.
 - Flowers can get a bit messy during dissection so have a trash can or a container to gather the pieces when finished for composting.
- Have flowers within sight of the students.
- Talk about how flowers can be male, female, or both. Talk about how flowers reproduce through pollen from an anther attaching to a stamen. Reference the *Alstroemeria* (Peruvian lily) figure in the flower terms portion of the handout.
- If there are enough give a flower to each student, if not, have students group in pairs or threes.
- Have students describe the parts to each other using the *Botany vocabulary* handout.
 - Reference the picture of a Peruvian lily and have students draw it themselves and identify the parts on their drawing using the guide.
- Show a composite flower such as a dandelion or sunflower, identify the interior flowers as disc flowers and the "petal" flowers as ray flowers.
 - Two kinds of flowers in one flower! Neat!
- Repeat these steps with as many flowers as desired. Using tricky flowers or imperfect flowers can be fun, such as poinsettias, hydrangeas, and peace lily flowers.
 - Whatever is used should be identified by the instructor prior to class to ensure no confusion comes up with the students.

1.1.2 Types of fruit

Teacher's notes: This lesson is meant to be a fun way to have a bit of a potluck while learning about fruit. Asking students to bring in their favorite fruits, nuts, legumes, etc. or foods that go

Everyone can Grow!

well with fruit can liven up the lesson. For many people, this lesson may be surprising due to the number of different kinds of fruit. This lesson will help people understand how to tell different kinds of fruit apart and most likely annoy their friends with their new-found knowledge. This lesson is largely for social interaction and fun, but still contains real, biological information about plants.

Materials:

- Many kinds of fruit. Be sure to have at least an apple or pear (pome), a banana or blueberry (berry), a zucchini or cucumber (pepo), a walnut or almond (dehiscent nut), hazelnut, acorn, or chestnut (indehiscent nut), a cone from a conifer (not a fruit!), a cone from an alder or a maple helicopter seed (samara).
- Knives, hammers, nut crackers, etc. available for fruit cutting.
- Paper, pencils, and other art supplies for note taking and drawing/identifying fruit and their parts.

Procedure:

- Print enough handouts for the proposed number of students.
- Set up the classroom with plenty of workspace for either single students or groups.
 - There will most likely be pieces of fruit left after this lesson so have a container to gather the pieces when finished for composting.
- Have students choose a fruit (including dry fruits like nuts) and have tools like knives, hammer, or a nut cracker, etc. available to either cut or pry them in half.
 - For indehiscent fruit have students puzzle out how best to get into the seed.
 - Make sure students don't get too silly, like using a hammer to open an apple, etc.
 - Fruits should be sliced in half as best as possible to reveal the way the seeds are encapsulated within the ovary.
- Explain the basics of fruit types from the handout and read the definitions aloud.
 - If possible point to that type of fruit on the table.
 - Since not all fruit types are present, it may also help to make a PowerPoint presentation with the different kinds of fruit.
- Have each student identify what type of fruit it is and write the fruit and the type of fruit on a piece of paper.
 - For artistic students, allow them to draw the fruit and write the name and type of fruit next to their drawings.
- Repeat this with all the fruit that the students chose to bring to class.
- Have a fun time eating fruit after students are done practicing.

Everyone can Grow!

1.2: Plant identification

Teacher's notes: Use the *Illustrated guide to plant identification handout* for these lessons. Plant identification has many uses, one of which is knowing how to look up plants that you see or own. This lesson is a great starting point for plant journaling or monographing classes. This lesson has been designed to fit whatever time spaces that are available. It can be as short as fifteen minutes with the proper preparations, or a few hours long depending on how much time is available for practice. It can be done indoors or outdoors depending on time, space, group size, location, and weather permitting. Larger groups may be easier to manage using an open format if there is only one teacher, for example, have some begin their drawings while others work on the handouts and then switch tasks for the groups so that both get the lesson and get time to work on their monographs.

Objective:

- Know how to identify different variations of plants' respective parts.
- Recognize plant identification terminology.
- List plant parts using proper terminology.
- Identify plants and make detailed observations.

Methods:

- Use the *Illustrated guide to plant vocabulary handout* to understand plant parts.
- Drawing leaves and practicing leaf part identification.

Background: Plant identification comes down to knowing the vocabulary of the parts. There are many complete books and guides out there and the handout for this lesson is just an overview of some of the more common terminology.

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

Everyone can Grow!

1.2.1: Plant identification vocabulary

Materials:

- *Illustrated guide to plant identification handout.*
- Several pieces of paper.
- Writing utensils.
- OPTIONAL: Have a dichotomous key (plant I.D. book) around and you can teach how to use that as well.

Procedure:

- Print enough handouts for the proposed number of students.
- Gather different kinds of leaves from outside. Try to be variable in the kinds you find so you will have more interesting things to show your students. (OPTIONAL: If it is a nice day, either take students outside to practice or have them pick their own leaves and return inside.)
- Make sure everyone has room to write and draw.
- Have everyone take at least one sheet of blank paper.
- Explain: Being able to identify plants is a great skill to have if you care for any kind of plant. It gives you the freedom to look up information specifically about the plant you have so you can give it the best care and receive its best growth in return.
- Give students a few minutes to explore the handout while explaining its uses.
 - Explain: The handout only contains the most common vocabulary for plant I.D. There are many more words available to choose from, but these seem to be the most common so they are a great place to start. The pictures are there to help visualize the definition of the terms used.
- OPTIONAL: If you brought a dichotomous key, take it out and have students try to identify their leaves or twigs.
 - If you don't know how a key works, it is basically a "choose your own adventure" where you use botany vocabulary to describe and choose between two different options at a time. Each time you choose an option, the book will tell you what to do next.

1.2.2: How to use a dichotomous key

Teacher's notes: A simple definition for a dichotomous key is that the prefix "di" means two so the key is a separation of two things. You choose one or the other option, but not both. This

Everyone can Grow!

lesson will assist students in understanding how to identify plants. For indoor plants, they can come from a wide array of places and can be more difficult to find than native plants. However, having this basic understanding will help them when searching online for a match to their plant. Having this knowledge helps make sure that a plant is getting what it needs. If you do not know what a plant is, you cannot properly care for it. Each plant is an individual and comes from a specific niche in the wild where they evolved to handle specific conditions, this must be taken into consideration when keeping plants indoors.

Materials:

- At least five different kinds of candy, or leaves, nuts, bolts, screws, nails, or any other somewhat related objects.
- Lined paper and writing utensils.
- OPTIONAL: A dichotomous key.

Procedure:

- Print enough handouts for the proposed number of students.
- Have students pair up.
- Gather up one of each of at least five kinds of semi-related objects and give each group their own set.
- Have students decide how to categorize the objects using successively finer groupings and write down their findings. Use these differences to make a dichotomous key starting from the largest category to the smallest.
 - For example:

1. Does it have a clear wrapper?	See question 2
1. Does it have an opaque wrapper?	See question 4
2. Is it a hard candy?	See question 3
2. Is it a chewy candy?	Caramel
chew	
3. Does the candy have stripes?	Peppermint candy
3. Is the candy one solid color?	Root beer
barrel	
4. Does it have a dark wrapper?	Riesen chocolate chew
4. Does it have a logo and a mostly clear wrapper?	Jolly
Ranchers	

Everyone can Grow!

- Have students share their keys with each other and discuss the differences. The main point here is that there are a lot of different ways these objects could be classified. OPTIONAL: Use a real dichotomous key with a known twig of a tree or shrub and get everyone to try to identify it. This way what they just learned is solidified by real practice.

1.3: Plant cells and their parts

Teacher's notes: Teaching the functions of cells does not have to be a confusing mess. Although a deep and thorough understanding is not the point of this lesson, it can help people who are unfamiliar with botany gain a greater understanding of its most basic functions. Keep this lesson simple and try not to overwhelm the students with information, there is always time to delve deeper for those interested.

Methods: This lesson would best be served as a lecture. Making the handout into a PowerPoint presentation would probably make this lesson easier on the students. This is not meant to be a detailed and confusing level of understanding, but instead an introduction to plant cells and their primary functions to pique the interest of prospective botanists.

Objective: Understand the parts of a plant cell and their functions.

Background: Plant cells are the foundation of plant life. They perform all the basic functions that keep plants producing food and growing. Although not strictly important to know in order for a plant to grow, it is fascinating to understand plants on a more intimate level and see just how different they are from animals. Anyone who grows plants can benefit from this understanding.

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

Materials:

- *Basic botany handout.*
- Writing utensils and paper for taking notes.
- OPTIONAL: PowerPoint presentation of *Plant cells.*

Procedure:

Everyone can Grow!

- Be sure to become familiar with Ch. 3 of the *Basic botany handout*.
- Print enough handouts for the proposed number of students.
- Have enough table space for students to sit and be comfortable.
- Begin by showing a diagram of a plant cell. There is one in the handout.
 - The most important parts of Ch. 3 to cover may be: (An asterisk indicates that the parts are unique to plants.)
 - Organelle: Any of the specialized structures within the cell.
 - *Cell wall: This is the epidermis or the outermost layer of the plant cells. Plant cell walls are made of cellulose.
 - *Chloroplast: This is the plastid where photosynthesis takes place.
 - Mitochondrion: Singular form of mitochondria. These are unique as organelles because they have their own DNA and are thought to be descended from bacteria. You may know this as the “powerhouse of the cell”. Their main function is to take in nutrients and break them down into energy, much like a digestive system. They create molecules that are full of energy that the cell then uses for other processes.
 - Nucleus: This is the largest organelle in a cell where the genetic material is stored.
 - *Vacuole: This is storage container in plant cells. They can store many things, chiefly water, but also food and enzymes.
- The more familiar you are with these terms the more detail can be added to the class.
 - For fun, you could allow the students to draw their own cells using the diagram as a guide. It can help retention to do this.

1.4: Photosynthesis and the importance of the colors of light

Teacher's notes: This lesson can be a great addition to lesson 2.1: *Selecting lights for indoor gardening* because it introduces the idea that plants react to certain colors of light.

Methods: Use *Basic photosynthesis* of the *Basic botany* handout to give an introductory understanding of photosynthesis and why the color of light matters. Making this part into a PowerPoint presentation may benefit the class.

Objective:

- Understand the basics of how photosynthesis works.
- Understand how photosynthesis moves through a leaf.
- Understand that chlorophyll reacts to different colors of light and produces different types of growth.
- Understand that there is a lot more to know about photosynthesis.

Everyone can Grow!

Background: Photosynthesis is how plants eat. They use it to produce sugars that are then translated into growth for the plant. This is an important step to learn in order to understand how plants live and develop.

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

Materials:

- *Basic botany* handout.
- Writing utensils and paper for taking notes.
- OPTIONAL: PowerPoint presentation of *Basic photosynthesis*.

Procedure:

- Print enough handouts for the proposed number of students.
- Make sure there is enough seating for students to be comfortable.
- This is a lecture. Become familiar with the content before the class begins.
 - Making this lesson into a PowerPoint presentation may be a good idea so students can see the various pictures in a large and easily accessible way.
- Begin the lesson with the overview of photosynthesis as an equation of light, water, and carbon dioxide being utilized by a plant to create sugars for food. Explain the differences in C3, C4, and CAM photosynthesis.
- Focus on C3 photosynthesis for simplicity.
- Go into more detail by explaining the journey of C3 photosynthesis through a leaf and show how it uses the chloroplasts to transform these ingredients into that sweet, sweet sugary goodness.
 - Stroma and thylakoids are cool!
 - Note that ATP and NADPH are used in energy production and movement through photosynthesis. It is pretty complex to explain, if you can, go for it!
- The Calvin cycle is a light independent cycle that works like a recycling center for the plant to help it produce extra energy. Although the Calvin cycle is light independent, it does not function at night because it is dependent on primary photosynthesis that does require light.

Everyone can Grow!

1.5: The life cycles of plants

Teacher's notes: There is a lot to know about the life cycles of plants, but this lesson is meant to introduce life cycles to students in a way that shows the differences between different types of plants without becoming too confusing. The main points to make are that there are plants that need pollinators and plants that don't need pollinators. Knowing the species of plant is always important for proper plant care and especially reproduction.

Methods: Use *Life cycles and reproduction* from the *Basic botany* *handout* as a guide for this lesson. Making this into a PowerPoint presentation may be useful for students to see the diagrams on a larger scale.

Objective:

- Understand that there are different types of strategies used by plants to grow.
- Understand the life cycle and reproduction of plants and how they differ.

Background: There are basic lifecycles that different types of plants use to grow and reproduce their seeds. The simplest is non-vascular plants, then seedless vascular plants, gymnosperms, and angiosperms.

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

Materials:

- *Basic botany* *handout*.
- Writing utensils and paper for taking notes.
- OPTIONAL: PowerPoint presentation of *Life cycles and reproduction*.

Procedure:

- Print enough handouts for the proposed number of students.
- Be familiar with the content of *Life cycles and reproduction* of the *Basic botany* *handout*.
- Explain the four major groups of plants:

Everyone can Grow!

- Non-vascular plants (bryophytes: moss, liverworts, etc.): Reproduces via spores, has no true roots or leaves. Requires steady moisture to survive.
- Seedless vascular plants (ferns, etc.): Has true roots and leaves, but still reproduces with spores. Mostly requires high moisture to survive.
- Gymnosperms (conifers, etc.): Has roots, leaves, and almost all have secondary growth (wood). Produces seeds, but not flowers or fruit. Uses cones for reproduction.
- Angiosperms (flowering plants): May or may not have secondary growth but has roots and leaves. Produces flowers and fruit for reproduction.
- Show the appropriate pictures for each type of plant or have students flip to the appropriate page in the handout.
- Notice that most plants have similar life cycles, they begin through reproduction, produce spores or seeds, germinate, grow into a mature plant, and the cycle continues.
- OPTIONAL: In bryophytes and seedless vascular plants, there is some crazy genetic flipping going on where the plant switches from being haploid to diploid during reproduction, meaning that the chromosomes go from being alone to being in pairs. Unlike in humans, where we have our chromosomes in pairs throughout our lives, these plants begin with a single set of chromosomes that only come together when reproducing. This can get confusing so leave it out if it seems appropriate.
- Since this is a lecture lesson, be sure to link everything back to the main points of the lesson.
 - Not all plants reproduce and live the same way.
 - Not all plants can be treated the same.

Everyone can Grow!

Module 2: The basics of indoor gardening

Gardening indoors can be just about whatever you want it to be. The trick is to mimic the conditions that will most benefit the plants you wish to grow. This can be a challenge for certain plants like annual flowers, but never say never, there are many ways to grow beautiful, air purifying plants just about anywhere you have available (so long as you don't mind what kind). This module focuses on the very basics to get started and what some of the easiest plants to take care of are, so you don't have to feel like you have a black thumb. There is no such thing! Everyone can grow! (See what I did there?)

2.1: Selecting lights for indoor gardening

Teacher's notes: Use the *Light sources* handout for this lesson. Plants photosynthesize, so the best place to get started when growing a plant is light. If you live in a basement or apartment with little to no natural light, then having a grow light is the way to go. Yes, there are plants that can grow entirely with artificial lighting, so there is absolutely a way for anyone to keep a houseplant so long as they have a power source for their lights.

Keep in mind that the height of light from the top of the plant makes a huge difference to the plant's uptake of the light's energy. Overall, it is best to follow the directions on grow lights to ensure your plants won't over heat (all bulbs generate at least some heat), but if you are seeing etiolation (long, spindly, pale growth), then think about how to increase light to the plant without increasing heat if possible.

Transforming the handout into a PowerPoint lecture might be an easier way to help people visualize the different terms and what they refer too. This is a little piece of a lesson, it is not meant to take too long.

Methods: Give handouts and demonstrate how to research different lighting options. How to learn is sometimes just as good as what to learn.

Objective:

- Gain confidence in understanding lighting equipment.
- Learn the basics of plant lighting needs.
- Describe signs to look out for that suggest a need for a change in lighting.

Background: Growing plants indoors can range from extremely forgiving and simple to quite a frustrating venture. Knowing the basics of plant care can increase the rate of success for growing plants indoors, although it is important to understand that every plant has its own needs and this guide will only be the introductory materials on a few easy plants to get started.

Everyone can Grow!

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

2.1.1: Light vocabulary

Materials:

- Light sources handout,
- YouTube video suggestions:
 - A good resource for hearing the vocabulary in use:
<https://www.youtube.com/watch?v=zluc1OqoS20>
 - A long resource on just about everything to do with lighting:
<https://www.youtube.com/watch?v=pyz5RFnhRuE>

Procedure: This is designed as a lecture style lesson. The handout contains most of the information needed to teach this lesson, so please refer to it. Lights are difficult to fully compare with an activity, so this lesson has some suggested videos to help students hear some of the ways lighting options are described to help them understand how to compare them and choose the best light sources for their indoor gardens.

- To begin the lecture, explain the terms in the handout and that light companies don't make it easy to compare light sources.
- Explain that there is no singular answer here, so it comes down to what is needed for specific plants and what budget someone has for their garden. For beginner, low light plants, a simple 60-watt LED equivalent bulb is probably the best place to start, unless they have a nice, bright, south or east facing window. Refer to the low light plants listed in the handout.
- For most indoor gardeners, super high efficiency, powerful lights should not be needed, but if they garden in a basement, and want to grow vegetables and flowering plants, it might be better to look into higher output lighting options.

Everyone can Grow!

- If choosing lighting for upright (at least 18-inch tall) terrariums and vivariums, make sure to suggest a slightly more powerful light (such as 100-watt equivalent LED bulbs) to ensure light penetration to the bottom of the enclosure.
- Always caution the students to keep their eyes open for etiolation! This will tell them early when to get a stronger light source for their indoor garden.

2.2: Soil basics

Soil is the foundation of a plant. It draws up its nutrients and water from the soil and holds itself in place with the soil. Since all plants have individual needs, it is important to understand how soil affects a plant and how to mix soil to make the perfect balance of drainage, nutrients, and moisture retention for each individual plant.

2.2.1: Parts to a soil mix and what they do

Teacher's notes: This lesson can be as simple as a question and answer session about soil amendments, or an activity that shows students the different parts and lets them feel the differences.

Methods: Use the *Soils* handout to illustrate what are the main focuses of soil for indoor gardens and show students how to make decisions for their own soil mixes.

Objective:

- Understand the three basic parts to indoor gardening soil: Moisture control, drainage, and nutrients (compost).
- Combine different soil additives together to create mixes that are appropriate for specific types of plants, I.e. tropical, desert, and food crops.
- Differentiate soil additives by sight and recite their uses.

Background: The best way to start caring for plants is from the ground up. Most plants rely heavily on their soil for nutrients and moisture. The soil a plant is in can make a huge difference to its ability to survive and thrive.

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?

Everyone can Grow!

- What did you like about the lesson?
- What did you not like?
- What could be done better?

Materials:

- *Soils* handout
- Ensure students have something to take notes with, paper, pencils, etc.
- OPTIONAL: Have dust masks available if mixing soil.
- Examples of the different types of soil amendments. The easiest ones to source may be:
 - Moisture control
 - Bark nuggets
 - Coconut coir
 - Vermiculite
 - Drainage
 - Perlite
 - Sand
 - Lump charcoal
 - Organic compost (any)

Procedure:

- Print enough handouts for the proposed number of students.
- Have enough chairs for all students to sit.
- OPTIONAL: Have dust masks available if mixing the soil parts! You'll thank me later.
- Have all soil parts freely visible on a table so all the students can see it well.
- Introduce the class with the idea that plants evolved to survive in certain conditions in the wild, and soil type was one of the conditions.
- Explain that every plant has its own needs, requirements, and is an individual. This is a great tip to help new plant owners to think about plants.
- Use the guide to explain the different soil parts.
- If desired, pair this lesson with repotting, allowing students to bring a plant that needs repotting or provide plants for repotting.
 - Use the recipes in the handout to make proper soil mixes based on the plants available.
 - OPTIONAL: Have a houseplant guide available to assist with identifying unknown plants, assuming students brought their own.

2.3: Caring for plants

Teacher's notes: Use the *Plant Care by Light Requirement* handout for this lesson. This module is closely related to the light requirement section of this module because this handout outlines the care of specific plants that are organized by light requirements. There is even a section on growing food crops indoors. To teach this lesson, it is integral to understand how proper lighting for plants affects plant growth.

Methods: Give handouts, teach how to research different plants, and how to identify the main components of plant care. Giving each person a plant from the handout could be a good way for each person to visualize what proper plant care looks like, because hands on learning can be more helpful than just listening to a lecture. The idea is to introduce individuals to basic plant care. Mainly, water, light, soil, and plant food requirements for a variety of plants. Note that since this guide is not exhaustive, additional measures will have to be taken to identify houseplants before their care needs can be ascertained. Please refer to the lessons on plant identification for some help.

Objective:

- Identify what are the most important parts of plant care.
- Understand the basics of plant care.
- Practice proper plant care for personal houseplants.

Background: Every plant has its own needs and requirements. This lesson helps explore the needs of these plants by light requirement to demonstrate that each plant is unique.

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

Everyone can Grow!

Materials:

- The materials for this lesson are going to be variable. In general, the *Plant Care by Light Requirement* handout is the only requirement.
- OPTIONAL: To make the lesson more hands on it might be useful to bring examples of plants from the *Plant Care by Light Requirement* handout or have students bring their own plants.

Procedure: This lesson is meant to be lecture based. By no means does this lesson need to take a lot of time. This could be a great filler piece for a longer meeting. The handout contains most of the information that is needed to teach this lesson, so please refer to it. OPTIONAL: It might be useful focus on just the types of plants that are interesting to the students present, due to the amount of variation in plant care contained in the handout.

- Begin by introducing the idea that each plant is unique and has its own needs. This would be a good time to tie into the light lesson, because these two lessons are connected.
- The best way to care for a plant is by knowing its species if possible. At least knowing the genus is usually enough to get by.
- OPTIONAL: Demonstrating how to repot a plant will be instrumental in helping students visualize what this process looks like.
- OPTIONAL: Demonstrating how to propagate a plant could also be instrumental in helping students visualize what this process looks like. It could also end up helping students save money in the future.
- Allow students time to ask questions and clear up any misconceptions that they may have. This lesson can be tailored to student's interests; therefore, this lesson has a lot of variability depending on what the class wants to know.

2.4: Growing sprouts and microgreens

Teacher's notes: Sprouts and microgreens are a popular, nutrient dense addition usually used in salads. As far as sustainability of sprouts goes, eventually you will run out of seeds to sprout unless you also have seed stock plants available to grow, so sprouts are not a cure-all for a diet. However, they can be a lot of fun and relatively cheap to grow while giving the satisfaction of growing something that can be eaten. The activities for this lesson are just tiny pieces and can be great filler for other crop related lessons.

Methods: Use the *Sprouting seeds* handout to teach students the basics of nutrition and how to grow their own sprouts.

Everyone can Grow!

Objective:

- Understand the health value of sprouts.
- Build their own sprouting systems.

Background: Sprouting seeds for food has become a popular trend in the past 30 years or so, but the practice dates to the 1700s when sailors used sprouts to supplement Vitamin C and prevent scurvy. The discovery of sprouts having this nutritional value is credited to Captain James Cook (International Sprout Growers Association, n.d.)

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

Materials: Depending on which project for sprouts is chosen, the materials will be either:

(Jar sprouting)

- Seeds
- Water
- A mason jar with 2-part lid
- Nylon screen (window screen)

(Container sprouting)

- Seeds
- Water
- At least a 4-inch square or round pot (larger is great too)
- Tray that holds water (seedling trays work great!)
- Fine soil mix
- Nylon screen (window screen)

Procedure:

- Print enough handouts for the proposed number of students.

Everyone can Grow!

- Have enough chairs for all students to sit.
- Have all necessary supplies prepared based on the handout.
- See handout for individual directions for each method of sprouting.
- Explain that sprouting is only as viable as the seeds used and only as sustainable as the seed supply. These nutrient packed micro-foods are unfortunately not sustainable without also having a few of the plants available to go to seed regularly to keep up the supply of seed.
 - Most seeds last up to a year before germination, but some can last longer, it really depends.

2.5: Growing oyster mushrooms

Teacher's notes: This is another activity-based lesson. The handout has a great recipe for making a suitable mycelial habitat for oyster mushrooms. This doesn't have to be a difficult lesson and is another perfect way to tack on an activity to other lessons, meetings, etc.

Methods: Use the *Oyster mushrooms* handout to make a mini mycelial garden.

Objective:

- Learn how to grow oyster mushrooms indoors.

Background: Oyster mushrooms are endemic to much of the United States

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

Materials:

- A ½ gallon milk or juice carton with lid. Rinsed well and dried.
- Stapler with staples.
- Unscented compressed paper cat litter or small animal bedding.

Everyone can Grow!

- Guinea pig food pellets, only pellets, no seeds! (Oxbow is expensive for this but works great.)
- A handful of oyster mushroom mycelium.
- A bottle for misting.

Procedure:

- Print enough handouts for the proposed number of students.
- Have enough chairs for all students to sit.
- Most of the physical procedure will come from the handout.
- Explain how mushrooms are not plants, but instead fungi, which are closer in relation to animals than plants.
 - They breathe oxygen.
 - They do not need light.
 - They must stay moist to survive.
 - The real, living portion of the fungi is the mycelium, not the mushroom.
 - This is my metaphor: Mushrooms are like apples on an apple tree. The tree is the mycelium. Gotta keep the tree healthy to get fruit, so to speak.

2.6: Building a basic hydroponic or aquaponics set up

Teacher's notes: Hydroponics and aquaponics are curious ways to grow plants that remove soil from the equation. Some believe that it is the future of farming, however, it is energy heavy and requires pumps and bubblers. This may indicate that it is not the most effective method of farming for the future. In contrast, it can be an effective way to grow plants in a small space, so long as electricity is available.

Methods: Use the *Basic hydroponics and aquaponics handout* for the instructions and materials based on whichever type of system that is chosen to be built.

Objective:

- To build a functioning hydroponics or aquaponics system.
- Understand the parts and functions of both a hydroponics and aquaponics system and how they differ.

Background: Hydroponics and aquaponics systems are used as space saving methods of producing food indoors. Hydroponics requires a nutritive solution for plant growth while aquaponics relies on fish for plant nutrition. In larger scale aquaponics, the fish should be kept in a separate tank from the plants with a pump used to cycle nutritive water through the plants and back into the aquarium.

Everyone can Grow!

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

Materials:

- Refer to the *Basic hydroponics and aquaponics handout* for specific materials needed for the chosen system.
- Tools will also vary depending on the chosen system.

Procedure:

- Print enough handouts for the proposed number of students.
- Prepare the proper tools and materials needed and be sure to have enough for each student.
- Instruct the students on the basics of the materials and that the simplest systems can be power-free but require frequent changes in the water or at the very least agitation to increase the release of nitrogen gases and increase oxygen in the water.
 - Roots do need oxygen so it is imperative to have some form of agitation whether mechanical or manual.
- If this lesson is meant to be purely lecture, it will be fairly short and concise from the handout. If an activity is included, allow at least a half hour for assembly.

2.7: Building an indoor composting worm bin

Teacher's notes: Composting is great for any garden, even an indoor garden. This is especially useful for those who want to grow their own food indoors as it gives them a supply of nutrients to rejuvenate their soil with.

Methods: Use *Raising and breeding worms* from the *Maintenance crews* handout to teach students about worms and vermicomposting.

Objective:

Everyone can Grow!

- Understand the lifecycle of a worm.
- Learn how to make compost using worms.

Background: Indoor worm composting is not a terribly common practice but has become more popular in recent years. It is a great way to recycle food scraps and fertilize houseplants.

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

Materials:

- *Raising and breeding worms* from the *Maintenance crews* handout.
- x2 roughneck Rubbermaid bins 15"x10"x7" or similar sized opaque bins with lids.
- Something to poke holes with.
- Something to cut with.
- Hot glue gun.
- Nylon screen (window screen).
- A handful of soil from outside.
- Newspaper or other kind of paper. Shredded as thinly and evenly as possible.
- Vegetable or plant scraps.
- About a pound of red worms.

Procedure:

- Print enough handouts for the proposed number of students.
 - Distribute handouts.
- Have enough chairs for all students to sit.
- Most of the physical procedure will come from the handout.
- Explain the life cycle of a red worm.
 - Worms are hermaphrodites, meaning they have both male and female sexual organs and require fertilization from a second worm to reproduce.

Everyone can Grow!

- The part of the worm where sexual organs is stored is called the clitellum, which is the band that is seen around worms.
 - Myth: Worms can be cut at the clitellum to form 2 worms. Nope. Cut a worm in half and it may survive, but the other part that is cut off dies.
- Worms hatch from eggs that are formed in the clitellum and it comes off the worm to form a sack called a cocoon where the eggs are contained.
 - Red wigglers can hatch 3-12 baby worms at a time.
- Show the parts of the bin and introduce the tools. There is a lot of flexibility to how to do certain parts and this should be prepared ahead of time so that the group has tools to work with.
- Use the handout to guide the students in building a worm bin.

2.8: Common pests, diseases, and remedies

Teacher's notes: This is another lecture style lesson. There are more kinds of pest and diseases than any one lesson can elaborate on, so focus on the most common issues found in indoor plants. There are a lot more pests involved with outdoor plants and if anyone sees those in their indoor garden, they might be doing something very wrong.

Methods: Use the *Common indoor pests, diseases, and remedies* handout to explain the various problems that indoor gardens can face and how to deal with them. This may be more effective as a PowerPoint presentation with pictures of the various diseases.

Objective:

- Understand the most common pests and how to manage them.
- Understand the difference between fungal, bacterial, and viral disease and their treatments.

Background: Every garden has its pests, even indoor gardens. The nice thing about indoor gardens is that with a bit of maintenance, most pests are easy to remove and keep from ever returning. Diseases are harder to prevent in some cases, but still something that can be managed. Remember that healthy plants resist pests and disease all on their own.

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?

Everyone can Grow!

- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

Materials:

- *Common indoor pests, diseases, and remedies* handout.
- Pens and paper for notetaking.
- OPTIONAL: examples of various diseases, pests, or personal examples of times you had to treat your plants, how, for how long, etc.

Procedure:

- Print enough handouts for the proposed number of students.
- Have enough chairs for all students to sit.
- If using a PowerPoint presentation, make sure everyone can see it well.
- Use the handout to describe different pests and disease, making sure to show the differences between viral, fungal, and bacterial disease.
- Explain how nutrient deficiencies work and how they mimic some of the same symptoms of disease.
- Allow for question and answer time so students can ask about specific things that they are interested in.

Module 3: Building an indoor ecosystem

Going beyond simply growing plants indoors, you can also manage a mini ecosystem in many ways. This module focuses on how to build, stock, and maintain indoor ecosystems that mimic multiple different natural biomes. They can be customized based on an animal habitat or based on the similar care requirements of the plants. The most wonderful part of these systems is that it gives a real time view of how ecosystems grow, change, and how different inputs can help or hurt the system. This is a fantastic metaphor for the earth's ecosystem and can really help build connections between how humans manage the earth and changes in the ecosystem.

3.1: Ecology of vivariums

Teacher's notes: Vivariums are a brilliant way to learn more about ecology. Through keeping them, students can make greater connections between the natural world and the tiny world living right in their homes. This lesson is to help introduce students to ecology through the metaphor of vivariums. In a way, we all live in a giant vivarium that is the world itself.

Methods: Use the *Building terrariums and vivariums* handout *Ecology of the vivarium*, to make the connection between vivariums and the ecosystems of the world.

Objectives:

- Understand the parts of an ecosystem and how they work.
- Identify the differences in light, soil, water, and temperature needs between desert, temperate, and tropical ecosystems.
- Explain the importance of ecosystems.
- Describe how the ecology of vivariums is similar to larger ecosystems, such as local, world, etc.

Background: Everyone lives in an environment, whether man-made or so-called natural. Indoors or outside, no one leaves the environment. Different climates, elevations, and historical conditions have caused the environment to have different areas with different weather patterns which favored certain types of lifeforms. Together these lifeforms form an ecosystem that includes all the plants, animals, fungi, bacteria, etc. that live in the biome (such as a forest or a tundra). It is from these different biomes that we can learn to build our own miniature ecosystems to mimic the major players that keep that ecosystem running and, in this way, learn more about how ecosystems work without the manipulation of humans.

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the

Everyone can Grow!

teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?

Materials:

- *Ecology of vivariums* from the *Building terrariums and vivariums* handout.
- Writing utensils and paper for taking notes.

Procedure:

- Print enough handouts for the proposed number of students.
- Begin by explaining the primary parts of an ecosystem: Producers, consumers, decomposers.
 - These parts each work together to create a cycle that moves nutrients from plants to animals and back to plants.
- Next, describe the three main types of ecosystems found in vivariums: Rainforest, temperate, and desert.
 - Explain the differences in light, heat, soil, and water between the systems and how they differ.
 - Rainforest: Most plants in a rainforest will be understory and live in at least partial shade. The temperature can be hot and humid or in temperate rainforests (for New Caledonia geckos) room temperature (68°-80°F) and humid (60%-80% day, down to 50% at night) is acceptable. Humidity is more important than watering frequently, as soggy soil can cause root rot. To keep humidity in an enclosure, reduce the screen front to reduce airflow and loss of moisture. Misting is not the best way to keep up humidity, although it can help in the short term. Be sure the soil can drain well and be careful not to overwater. In rainforest set ups a false bottom to collect excess water is important.
 - Temperate: Some plants will be understory and shade and some will be full sun. This will depend on whether the habitat is plains or a forest/swamp set up. The temperatures in true ecosystems will vary seasonally, and for some animals it is important to allow adults to go through a brumation period over winter. This can be challenging for new animal keepers, so do some research and make sure it will not be needed.

Everyone can Grow!

Soil can be anything from high organic matter to clay and will mostly be well draining and can be allowed to dry out in between watering.

- Desert: These plants almost exclusively live in hot, full sun and require high amounts of light to thrive. However, there are exceptions, so research is key. The water requirements for deserts is slim and humidity should be avoided for desert plants. Heat lamps are wonderful ways to dry out any humidity in vivarium ecology. If the animal requires some humidity, build a hide specifically to keep moist for the animal. The soil of most deserts is rich in clay and typically hard and packed, not loose like sand. Keep this in mind for animals and be sure that the soil will be compatible for both the plants and animals. In captivity, loose substrates have been believed to cause impaction of the intestines from animals ingesting substrates, but that may also be linked to neurological conditions caused by being in captivity.
- Allow room for questions and answers.
- **OPTIONAL:** If this lesson is used as the introduction to building a terrarium or vivarium, introduce the parts to the project here.

3.2: Terrariums and vivariums

What are terrariums and vivariums? A terrarium is a plant-based ecosystem while a vivarium specifically intends to mimic an animal's habitat. Yes, these terms are loosely used and sometimes interchanged in ways that are not quite correct, but it is still good to know what they mean and how they will be used here. Besides, why keep a simple houseplant when you can keep a work of art? That is what attracted me to the idea, well, besides the science. Ecology rules!

Teacher's notes: This lesson is flexible in its application. It will cover the basics and parts, but how to use them is an individual art. There are so many different kinds of terrariums and vivariums that listing the instructions for all them might just be impossible. However, by understanding what goes into making and maintaining one of these beauties, the options for how you build opens up to you. **CAUTION:** Make sure to source native plants ethically and do not pick a plant if there are not 10 more in the area. Be sure to not collect plants from public lands, National or State Parks without proper permission.

Objective:

- Learn the parts and equipment for terrariums and vivariums.
- Complete building a terrarium or vivarium.
- Understand how to maintain their new mini-garden in a box.

Everyone can Grow!

Methods: Use the *Building terrariums and vivariums* handout to build a vivarium and/or terrarium.

Background: Terrariums and vivariums are wonderful ways to learn more about how ecosystems function and what are their primary parts. Through building the system, a close look into how the parts work together becomes clear and concise as each part fits into different roles amongst the system as a whole.

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

3.2.1 Basics of building a terrarium or vivarium

Teacher's notes: Use the *Basics to terrarium and vivarium building* handout (appendix 3) as a guide for this lesson. Typically, the term terrarium is used when discussing arid ecosystems, while vivarium is used to refer to tropical ecosystems. This is not entirely accurate, but it is common enough that it is important to note here. The true meanings of the terms are that terrariums are habitats for plants while a vivarium is meant to mimic the habitat for an animal, such as reptiles or amphibians. Vivariums are also sometimes called bio-active habitats by some, so that is another term to keep in mind.

Materials: The *Building a terrarium or vivarium* from the *Building terrariums and vivariums* handout is a great starter guide to use for these projects. Choose one of the terrarium or vivarium designs from the hand out and gather the appropriate supplies.

- Some basic supplies include:
 - Appropriate substrate
 - Vinyl mesh screen
 - Aquarium pebbles/eggcrate/hydro beads/etc. for drainage layer (if applicable)
 - Drill with multiple sized drill bits (these really depend on the types of screws used, and whether or not you decide to put in a drain)
 - Anodized aluminum or other wire

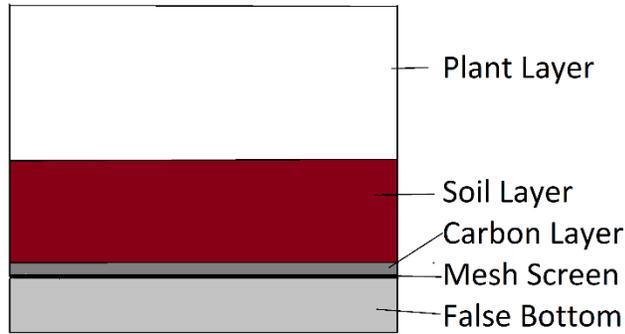
Everyone can Grow!

- Gorilla tape or similar strong tape
- Hack saw
- Screwdriver
- Scissors/box cutter/utility knife
- Natural sticks
- Conifer cones
- Dried leaves, etc.
- Springtail and isopod cultures, and worms are optional (and the best ones are red wigglers).
- For upright terrariums/vivariums:
 - 100% silicone
 - Isopropyl alcohol
 - Turn button with screw
 - Spline
 - Window screen frame with enough window screen to form the door
 - A door knob with screw
 - A piece of corrugated plastic to make a dam in the front to hold in soil.
 - Whew. That's the essence of it.

Procedure:

- Print enough handouts for the proposed number of students.
- The basic steps will be these:
 1. Container (could be just about anything clear-bodied)
 2. Dam (if needed)
 3. Drainage layer (false bottom)
 4. Mesh (vinyl screen)
 5. Carbon layer (aquarium carbon or crushed lump charcoal)
 6. Soil (varies depending on plants and use)
 7. Plants (varies)
 8. Door (if needed)

Everyone can Grow!



- Some tips are to pre-mix substrates for the students. This should ease the difficulty, as well as pre-cutting the drainage layer cover (window screen) if possible. (If everyone brings their own bottles or other containers this won't be possible.) Also, make sure that plants have either been pre-potted into purely organic soil (for vivariums) or that the students have a way to un-pot and rinse the roots. For plants bought in stores where chemical fertilizers/pesticides may have been used, make sure to rinse the entire plant. Some even say to soak it, I just give them a very thorough rinsing. For vivariums it is very important not to use any plants with chemical fertilizers and pesticides because it can kill the clean-up crew. Isopods, springtails, and worms can also be used in terrariums, so think about the safety of the animals you add, no matter how small.
- If doing a mixed project class, be sure to be familiar with the basics of building each model so that you can help students along the way.

3.4: Aquariums

Teacher's notes: For this lesson it is strongly recommended to have read, *The ecology of the planted aquarium*, *Practical aquarium set up and maintenance*. It contains all the basic practical knowledge that will be talked about in this lesson. The whole book, although technical, is a wonderful resource for anyone interested in the science of fish keeping.

Methods: Use the *Natural fish keeping* handout to teach the practical instructions for building and maintaining an aquarium ecology without the use of mechanical instruments.

Objective:

- Understand how to build and maintain a naturally cycling aquarium.
- Understand how to choose proper fish and plants for the chosen size of the aquarium.

Background: Aquariums are popular ways to keep animals indoors that otherwise would be difficult to see in nature. They are known for being peaceful and attractive additions to a home and for many, are a way to keep exotic and sensitive animals that are brightly colored and beautiful.

Everyone can Grow!

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

Materials:

- *Natural fish keeping* handout.
- An example of natural aquarium keeping by Foo the Flowerhorn:
 - <https://www.youtube.com/watch?v=NbOrGRhfdL0&index=5&list=PL2155euLw9DN6EU2zBTIDj8-q572aZv7w>
- OPTIONAL: *The ecology of the planted aquarium* by: Diana Walstad.
- A tank or container for fish.
- Organic soil or a 1:1 ratio of organic compost and coco fiber
- Aquatic plants
- Aquarium pebbles (small size)
- Aquarium water conditioner or water that has had 24 hours to outgas chlorine.

Procedure:

- Print enough handouts for the proposed number of students.
- Introduce the idea that aquariums can be fun and easy to keep, if one has enough patience to allow the ecosystem to build up properly.
 - The physical method for building an aquarium can be found in the *Natural fish keeping* handout.
- Important notes to make about fish keeping:
 - Use the handout as a guide for information for the class.
 - Beginners should start slowly and do lots of prior research.
 - 1” fish per gallon is a suggestion, more advanced fish keepers can learn to balance the oxygen and nutrient output of fish with time, so tanks that would be considered overstocked in a fresh set up would not be so overstocked when the tank is seasoned.
 - BE PATIENT! Ecosystems do not develop in a day or even a week. It needs to be stressed to let the plants settle in before adding fish.

Everyone can Grow!

- Fish do not need to eat every day. Especially if the tank is new. Feeding once every other day gives more time for bacteria to work on converting ammonia into nitrite and eventually into nitrate. It also gives the plants more time to absorb nitrogen in all three forms, which means healthy, unburned fish.

3.5: Maintenance crews

Teacher's notes: The maintenance crew is the foundation of any vivarium. Understanding the roles of each member helps when making decisions for what needs to be a member of a maintenance crew for a particular animal.

Methods: Use the *Maintenance crews* handout to teach students what the typical members of a maintenance crew are and what are their individual care needs.

Objective:

- Identify different members of a maintenance crew.
- Understand their various roles.
- Understand the basics of husbandry to keep a colony of them alive.

Background: It is essential for every vivarium to have a clean-up or maintenance crew that works as decomposers. Their function works to break down detritus into nutrients that the plants in the vivarium can use to grow and remain healthy. They also work to reduce the smells of feces and other rotting matter in the enclosure which is pretty nice. The vivariums tend to smell like healthy earth, which can smell good, if you like that sort of smell.

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

3.5.1: Raising and breeding cockroaches

Teacher's notes: This activity can be added to other lessons or used alone as a snippet. Actually, building these enclosures takes very little time when well prepared.

Methods: Use *Raising and breeding cockroaches* from the *Maintenance crew* handout.

Objective:

Everyone can Grow!

- Understand how to care for cockroaches
- Set-up a cockroach enclosure

Background: These are a staple feeder for most large insectivores. Cockroaches have more protein, fat, and calcium than crickets. However, you must ensure that the animal in question will eat them. Some animals are picky and crickets seem oddly more palatable to some animals.

Materials:

- Hot glue gun and hot glue sticks
- Utility knife
- Scissors
- A medium to large (10-30 gallon) storage tote with lid
- Organic soil: 2:1:2 mix of Coco fiber, sand, and wood chips
- Dry leaves
- Mesh screen
- Clear tape
- Heat pad with a thermostat set to 86°F (Thermostat may have to be bought separately)
- Little bowls, Tupperware, or really anything that can be used as a bowl for food and water

Procedure:

- Print enough handouts for the proposed number of students.
- Have all parts ready for either students to put together or for a demonstration.
- Reference *Raising and breeding cockroaches* for the details of how to set up their home.
- Tips for this are to pre-mix soil for ease of use for the students. Basic tropical mix works well for isopods.
 - 2-parts coco fiber
 - 1-part sand
 - 1-part bark chips (untreated)
 - 1-part organic soil or compost
- Clear tape is a good idea to use as a barrier for these insects, they can sometimes crawl up the sides of plastic containers but can't climb on the glass smooth surface of clear tape.
- OPTIONAL: Mark the bin with the date the bin was made for reference.
- This activity is fairly simple and would be perfect as something to tack onto a longer lesson or as a brief lesson when time is short.

3.5.2: Raising and breeding crickets

Teacher's notes: Why soil is not used directly in the bin for crickets is to control where they lay eggs. The males tend to cannibalize babies and eggs, so they must be protected by mesh. Crickets chirp, so make that note several times throughout the session. They are loud in numbers. Banded crickets have smaller wings and are somewhat quieter since they cannot chirp as loudly. They are also known for being smelly, so keep that in mind as well.

Methods: Use *Raising and breeding crickets* from the *Maintenance crews* handout to learn more about keeping crickets.

Objective:

- Understand how to care for crickets
- Set-up a cricket enclosure

Background: Crickets are more of a food source than a maintenance crew. However, there are many insectivores that require a constant supply of these insects and having to constantly source them can become tedious and expensive. Keeping a colony of these animals can be a good source of fresh, healthy food for animals, and a protein source for the intrepid human. (So long as you are not allergic to shellfish, like me.)

Materials: A medium to large plastic bin with a top, nylon mesh, a utility knife,

Procedure:

- Print enough handouts for the proposed number of students.
- Have all parts ready for either students to put together or for a demonstration.
- Reference *Raising and breeding crickets* for the details of how to set up their home.
- Clear tape is a good idea for these insects, they can sometimes crawl up the sides of plastic containers but can't climb on the glass smooth surface of clear tape.
- OPTIONAL: Mark the bin with the date the bin was made for reference.
- This activity is fairly simple and would be perfect as something to tack onto a longer lesson or as a brief lesson when time is short.

3.5.3: Raising and breeding isopods

Methods: Use *Raising and breeding isopods* from the *Maintenance crews* handout to learn about basic isopod care.

Objective:

- Understand how to care for isopods
- Set-up an isopod enclosure

Background: Isopods are one of the staples of maintenance crews. They help cycle detritus from animal feces, rotting plant matter, and food. These are arguably the most fun to keep

Everyone can Grow!

because of their size and the fact that they can be easily handled without escaping. (They are my favorite too!)

Materials: 6-quart plastic shoebox, something to poke holes with: nail and hammer, small drill bit, wood burner, etc., tropical soil mix, dry leaves, fresh veggies, and an isopod culture.

Procedure:

- Print enough handouts for the proposed number of students.
- Have all parts ready for either students to put together or for a demonstration.
- Reference *Raising and breeding isopods* for the details of how to set up their home.
- Tips for this are to pre-mix soil for ease of use for the students. Basic tropical mix works well for isopods.
 - 2-parts coco fiber
 - 1-part sand
 - 1-part bark chips (untreated)
 - 1-part organic soil or compost
- OPTIONAL: Mark the bin with the date the bin was made for reference.
- This activity is fairly simple and would be perfect as something to tack onto a longer lesson or as a brief lesson when time is short.

3.5.4: Raising and breeding springtails

Objective:

- Understand how to care for springtails
- Set-up a springtail enclosure

Background: Springtails are an integral part of building and keeping vivariums. These tiny arthropods eat fungi and help keep the cycle of nutrients flowing. Understanding how to keep a culture of these animals going is a good way to keep a backup system in case of an emergency or so that more vivariums can be built over time.

Materials: 6-quart plastic shoebox, something to poke holes with: nail and hammer, small drill bit, wood burner, etc., crushed lump charcoal, rice grains, and a springtail culture.

Procedure:

- Print enough handouts for the proposed number of students.
- Reference *Raising and breeding springtails* in the *Maintenance crews* handout for details of how to set up their home.
- This is as simple as poking in a few airholes into a plastic bin.
- Add in the lump charcoal.
- Add in water to just below the tops of the charcoal.
- Add a few rice grains to the carbon islands that poke above the water.

Everyone can Grow!

- Add in the springtails.
- Feed every few weeks as the rice disappears.
- OPTIONAL: Mark the bin with the date the bin was made for reference.

3.5.5: Raising and breeding worms

Teacher's notes: Please reference lesson *2.7: Building an indoor composting worm bin* in this Teacher's guide for the full details of how to build and manage a worm bin.

Objective:

- Understand how to care for and manage worms
- Set-up a worm bin

Background: This is the same thing as keeping a worm bin for compost, the only real difference is that instead of focusing on the generation of compost, the focus is on breeding the worms for use as either food or maintenance crewmembers in vivariums.

Procedure:

- It does not seem prudent to rewrite the procedure for *2.7: Building an indoor composting worm bin* here, since this is essentially the same activity, just with a different focus.

Everyone can Grow!

Module 4: Plants and art!

What is life without art? From using art to help you keep track of plants that you have seen so you can identify them, to using plants to make beautiful creations, art has its place among indoor gardening. After all, keeping plants indoors, is in itself, an art.

4.1: Monographing and plant journaling

Teacher's Notes: Use the *Illustrated guide to plant terminology* handout for this lesson. Use some example monographs to help students get inspired. This practice can be super fun and sometimes it can be challenging to get people to believe they can draw. Be supportive and let them know that anyone can draw and skill doesn't matter. As long as the artist can identify the parts of what they drew, that is all that matters.

Objective:

- Learn more about plants through keeping an observational journal.
- Understand the basic history of monographing.
- Make conceptual connections about plants within their ecosystems.

Methods: Use real plants in a real-life setting if possible. Using dried specimens, or collected is also fine for the first lesson, but nature journals are meant to be documentations of experiences, so keep it as experiential as you can.

Background: Keeping a nature journal is by no means a new idea. They were very popular back in the 1800s when European naturalists used them to document and describe species that they saw during their travels. A famous example of someone who kept a nature journal is none other than Charles Darwin himself. He kept detailed descriptions of animals that he encountered in monograph form.² A monograph is a single specimen in a nature journal, which is illustrated and given detailed descriptions.

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?

Everyone can Grow!

- What could be done better?

Materials: *Illustrated guide to plant terminology* handout. Pencils, paper, drawing utensils of some kind, a flat surface or clipboard. OPTIONAL: a loupe (jeweler's magnifying glass) or magnifying glass, a dichotomous key, and examples of finished monographs.

Procedure: Make sure all students have paper, either a clipboard or other flat surface, and some form of artistic utensil, pencil, pens, charcoal, paints, basically whatever they feel comfortable with.

- Print enough handouts for the proposed number of students.
- Have the students go outside if possible and find an interesting plant to draw. SKILL IN DRAWING IS NOT REQUIRED! Just do your best! You needn't go far, even a plant growing up through a crack in the sidewalk is a great way to get started with monographing and helps the students understand that all plants matter and can be observed, regardless of their location.
 - OPTIONAL: Using tools like a 10x or 40x magnification loupe can make finding small plants and mosses more interesting and are a rewarding challenge to draw.
 - OPTIONAL: Having a dichotomous key can help you include some plant identification into the lesson if the students seem interested. See lesson 1.1.2 for how to use a dichotomous key.
- This lesson is easy on the teacher, just let students know to describe the parts of the plants that they draw using the vocabulary guide and describe any other animals or nearby plants as well. Having them record location, date and time, weather, and other factors are also good practice for monographs, especially if the students want to identify what they find later. If they want, they can even add how they are feeling to the journal and make it more personal. How they keep their journal is entirely up to them.

4.2: Herbariums

Teacher's notes: This lesson does not necessarily need a plant press. Books, and other heavy things can be used to press leaves and flowers for use in herbarium samples.

Methods: Press and use dried leaves and flowers to make herbarium samples for use as identifiers in accordance with the *Herbarium* handout.

Objective:

- Understand what herbariums are.
- Understand how to press and prepare an herbarium sample.

Everyone can Grow!

Background: Herbariums are a method that scientists use to keep genetic material from species as time progresses. For the hobbyist, they can be lovely ways to preserve native and other plants as a record to compare against when that species of plant is encountered again.

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

Materials:

- *Herbarium* handout
- Writing utensils and paper for taking notes
- OPTIONAL: Proper clothes for the weather for collecting specimens and something to cut with; i.e. scissors, knife, pruning shears.

Procedure:

- OPTIONAL: If planning an outdoor excursion, be sure to warn students to wear appropriate weather-proof gear and bring something to cut with.
- Print enough handouts for the proposed number of students.
- Begin by explaining the scientific background of herbariums and how they are used as repositories of genetics and the history of the morphology of plants (how they look).
- Use the sample label to go into detail about what types of information should be gathered in the field. Without this info, keeping a record of samples becomes nearly impossible and going back to fill in any information that was missed is not easy even if it is possible.
- Information to gathering the field when collecting the sample should include:
 - Date
 - Common and scientific names of the plant
 - Names of collector(s)
 - Habitat the plant was found in
 - Description of plant
 - Description of the area the plant was found, such as coordinates, but other types of descriptions that can help you find that place again are good enough
 - Altitude

Everyone can Grow!

- Any additional notes that seem important at the time
- OPTIONAL: If a collection excursion is desired, have students write down the above information to collect and allow them to go out and explore the nearby area and collect something for practice.
 - Use the various methods detailed in the handout to press whatever is collected.
 - Answer any questions about the types of information needed and use the examples as guides.

4.2.1: Building a plant press

Teacher's notes: These are simple and fun to make. If the wood is pre-cut before the lesson starts, more time can be spent looking for plants to press.

Methods: Use the *Herbarium* handout to build a plant press.

Objective:

- Build a plant press.
- Understand how these are useful for collecting and processing herbarium samples.

Background: Plant presses are tools used to prepare plant specimens for mounting in an herbarium sample. Although not strictly necessary, they can be useful for those committed to keeping a physical record of the plants they find or who are interested in making art from pressed plants.

Materials:

- Saw or hacksaw
- Measuring tape
- Marker
- Utility knife
- Scissors
- 7/16" Thick 2' x 4' plywood
- Cardboard
- Newspaper
- 2 Ratchet straps
- OPTIONAL: Find plants outside or buy flowers to press in the newly made presses

Procedure:

- Decide before the lesson how many and what size leaf presses will be made at this workshop.
- Print enough handouts for the proposed number of students.

Everyone can Grow!

- Gather all the tools and materials that will be required to build the presses ahead of the activity.
- Begin the lesson by explaining the uses of plant presses for herbariums as well as art purposes.
- Pressing flowers, leaves, and other plants can be a lot of fun. They can be used to make all sorts of interesting works of art, such as framed pressed bouquets, pressed flower and leave paper, and other ideas.
- Use the directions in the handout for the specific steps to building a plant press.
- OPTIONAL: If desired, have the group take some time to collect some plants from a nearby area or use bought flowers. Don't forget to date when the plants were added to the plant press. It takes about 2-3 weeks for non-woody plants to fully press and dry.

4.2.2: Mounting an herbarium sample

Teacher's notes: This can be done in many ways. It can be used as practice for mounting scientific samples or used as a way to make art pieces. Who said pressed, identified plants can't be arranged? Being creative can make some lovely pieces where all the plants are identified.

Methods: Use the *Herbarium* handout as a guide to the different methods to mounting herbarium samples. Here, creativity can really make this process fun. OPTIONAL: Use the *Plant identification terminology* handout to describe the parts of the plants and use a dichotomous key to identify the plants found or used.

Objective:

- Understand the scientific standard for mounting an herbarium sample.
- Prepare an herbarium sample or art piece.
- OPTIONAL: Identify the plants used.

Background: This is a necessary part of keeping an herbarium. Getting some practice is a great way to understand what kinds of information is needed for samples and how different techniques for mounting work. It is good to remember that different official herbariums may have their own standards for mounting samples and since this herbarium belongs to the individual, it is fine to let students decide which methods work best for them.

Materials: This will depend on the method desired, but if possible, having several methods available to try out will allow for students to have a better idea of what methods they like. Materials could include:

- Laminator with 3mm or 5mm sheets (these will likely be 9" x 12")
- Card stock or herbarium paper (official size is 11.5" x 16.5", but 8.5" x 11" is fine for home herbariums)
- Cellophane tape

Everyone can Grow!

- Mod Podge (spray can is best, or a jar of it with a brush)

Procedure:

- Use the *Herbarium* handout for the steps to mounting.
- Print enough handouts for the proposed number of students.
- Preparing dried samples well in advance of the class will be necessary. This lesson is a great follow-up to building a plant press. Students can then use their own samples.
- Regardless of the method used, none of them are terribly difficult, except the Mod Podge and paintbrush is really messy and might get frustrating to some students, so keep that in mind.
 - If using Mod Podge and a paintbrush, it can help to add a layer of the glue on the paper first, position the plant and tape it down and then add one more layer of Mod Podge on top of the sample to preserve it. Be careful not to rip the plant, so be gentle with the brush.
- There are two ways to add the information on the plant, one is to tape, glue, or laminate in an information card, or use an entirely separate page (this was my strategy when I made mine).

4.3: Pressed plant art

Teacher's notes: This is where creativity gets to fly! Pressed plants are not just for herbariums and science, they can be for art as well. One of the easiest and prettiest things that can be done is to use the principles of herbarium samples to make a flower arrangement on a piece of cardstock and then frame it.

Methods: Use the *Pressed plant art* handout for ideas that can be done with pressed plants.

Objective:

- Practice some creative ways to use pressed plants.
- Learn about recycling paper.
- Have fun!

Background: Pressed plants can be used for a plethora of artistic concepts. This lesson will only be giving a few ideas that will be fun and quick to produce. However, some of the projects may take some time to dry.

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?

Everyone can Grow!

- What did you like about the lesson?
- What did you not like?
- What could be done better?

4.3.1 Pressed plant paper

Teacher's notes: Making paper is a fun activity and can be used to make stationary, cards, and booklets, among other creative ideas. This project can be a bit of a mess, so be ready with gloves, plastic, and plenty of absorbent material to put it all together. Just as a tip, using a kitchen beater (for about 5 minutes) produces acceptable results, but the paper does not become fully pulped, so it has a rougher texture than well ground paper.

Materials: *Pressed plant art* handout. OPTIONAL: *How to make paper out of recycled paper*, by Make Something: https://www.youtube.com/watch?v=RR_218EtLJU, and *How It's made paper*, by How it's Made: <https://www.youtube.com/watch?v=Gq7L9-0XdVw>

Procedure:

- Print enough handouts for the proposed number of students.
- Assigned time will change how much is done before the activity so make a plan for what needs to be completed beforehand and what will be done during the lesson. The more organized the better.
 - Building the deckles before the activity can make the lesson go much faster.
 - Pre-soaking the paper is another way to quicken the process for the lesson.
 - Having a paper shredder is a great way to get the paper started, although ripping paper into bits can be an oddly therapeutic activity.
- Use the handout for the steps to make paper and the deckles. Without some form of frame, paper making is near impossible, but with ingenuity, it could be done.
- This is a highly individual art, once the paper is made, decorating is best left to the students.

4.3.2 Pressed plant bookmark

Teacher's notes: Many of the methods for this project could be in line with making paper from the previous activity. Put yourself in a creative mindset, because this is all fun.

Materials: There are a lot of things that can be used for this, the staples will be:

- Glue or Mod Podge
- Card stock or handmade paper
- Laminator and laminate
- ¼" Tape
- Pressed plants such as flowers, leaves, and ferns

Everyone can Grow!

- Hole punch
- Ribbon

OPTIONAL:

- Glitter
- Construction paper
- Cut out words from magazines, newspaper clippings, etc.
- Confetti
- Glitter glue
- Paints
- Markers, crayons, pens, pencils, etc.

Procedure:

- Print enough handouts for the proposed number of students.
- The idea behind this is pure creativity, so go wild!
- Make sure to set up any supplies needed well in advance.
 - Having little bowls or bins with things in them can really make this fun and organized.
 - Have waterproof table cloths if possible for an easier clean up.
 - Expect a bit of a mess as things might get around, especially glitter!
- Introduce the class by explaining the exercise. This is art and whatever you have available is up for grabs to use to make whatever work of art bookmarks desired.
- Recommend the common sizes for bookmarks: 2" x 6", 2" x 7", and 2.5" x 8".
- Don't forget to have them punch a hole in what they want to be the top so they can add the tassel later!
- Follow the instructions in the handout for how to put a bookmark together. This is a fun, easy exercise that anyone can enjoy including children.

4.3.3 Pressed plant portrait

Teacher's notes: This is no different in steps than making a bookmark. The thing here is to make a portrait of sorts out of pressed plants and flowers. Photos can even be fixed to the center and plants used to frame it on a piece of card stock or canvas. These are meant to be framed works of art to decorate a home.

Materials: There is no real wrong thing to use here. The essentials will be:

- Glue or Mod Podge

Everyone can Grow!

- Card stock or handmade paper
- Laminator and laminate
- ¼" Tape
- Pressed plants such as flowers, leaves, and ferns

OPTIONAL:

- Glitter
- Construction paper
- Cut out words from magazines, newspaper clippings, etc.
- Confetti
- Glitter glue
- Paints
- Markers, crayons, pens, pencils, etc.
- Picture frames
- Photos or cut out words.
 - For example: Hope, love, or peace

Procedure:

- Print enough handouts for the proposed number of students.
- The idea behind this is pure creativity, so go wild!
- Make sure to set up any supplies needed well in advance.
 - Having little bowls or bins with things in them can really make this fun and organized.
 - Have waterproof table cloths if possible for an easier clean up.
 - Expect a bit of a mess as things might get around, especially glitter!
- Introduce the class by explaining the exercise. This is art and whatever you have available is up for grabs to use to make whatever work of art bookmarks desired.
- Follow the instructions in the handout for how to put a portrait together. This is a fun, easy exercise that anyone can enjoy including children.

4.4: Making a mixed plant planter

Teacher's notes: Putting different species of plants together in a pot runs the risk of certain plants outcompeting others, however, it does make a lovely display. It is important to be familiar with the care requirements of plants for a successful mixed planter.

Everyone can Grow!

Methods: Use the *Plant care by light requirement* handout as a guide to what types of plants could potentially be planted together in a pot.

Objective:

- Understand how plants work for and against each other when occupying the same space.
- Understand how to select plants for mixed planters and how some plants are best for foreground, midground, and background.
- Create a plan for putting together a small mixed plant planter.

Background: Mixed plant planters have been used to beautify both indoor and outdoor spaces for many years. These wonderful works of art are not unreachable or difficult to care for any more than any other houseplant, so why not build a beautiful planter to enjoy a spot of life?

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

Materials:

- *Plant care by light requirement* handout
- Paper
- Drawing and writing utensils for taking notes and making sketches
- An internet connected device and/or books on plant care

Procedure:

- Print enough handouts for the proposed number of students.
- Introduce the lesson by explaining that the point is to understand the steps to take to decide what plants have the highest likelihood of cohabitating in a single pot.
- Use the *Plant care by light requirement* handout to explain how different plants have different needs and that it is important to understand these needs to pick out appropriate plants to live together.
- Using internet connected devices and/or books on plant care, allow students to research the needs of different plants and come up with a plan to share with the rest of the class.
 - Paper and drawing utensils may be used to make sketches of the proposed designs.

Everyone can Grow!

- Have students share these designs and explain why the plants can work together in the same pot.
- OPTIONAL: This can be tied into how plants in larger ecosystems coexist if desired.
 - Tying this lesson into *Lesson 3.1: Ecology of vivariums* in this guide is a good way to bring the points together.

4.5: Making concrete planters

Teacher's notes: Be prepared for a mess. Concrete is sticky and will stain almost any surface in stone, so have a non-porous surface to work with if possible. Tarps, vinyl table cloths, or visqueen (plastic sheeting) are all good choices to keep the mess easier to clean in the end.

Methods: Use the *Concrete planters* handout to make personalized planters.

Objective:

- Understand how to use concrete to make planters.
- Make a planter.

Background: Being able to make planters can bring a feeling of accomplishment and full customizability of houseplants. No two of these are alike and wonderfully messy fun to make.

Evaluation: It is always a good idea to get some type of evaluation and discussion at the end of a lesson, so here are some suggested questions to ask students. Evaluations give you as the teacher a chance to see how the lesson was received by the students and brainstorm ways to improve it.

- Was anything interesting?
- Did you learn anything surprising in the lesson?
- What did you like about the lesson?
- What did you not like?
- What could be done better?

4.5.1: Scrap cloth planters

Teacher's notes: These are messy and having disposable gloves on hand can really help reduce the clean-up in the end.

Materials:

- Concrete mix
- Water
- A few buckets
- Trash bags or other plastic sheets
- Old cloth or towels

Everyone can Grow!

- OPTIONAL: Rope such as hemp, burlap, or even paracord
- OPTIONAL: *How to make Cement Planters - DIY Cement Planter* by: DIY and Paper Crafts: <https://www.youtube.com/watch?v=cTLhJgNzP5g>
- OPTIONAL: *Fabric Concrete Flowerpot Making-2 & Easy and Interesting Method* by: Hüseyin Güler: <https://www.youtube.com/watch?v=MOAK1Kg5edE&t=1s>

Procedure:

- Print enough handouts for the proposed number of students.
- For this lesson, invite students to bring old clothes or towels to use for their planters.
- Be sure to have a plan for how to set up the work area before hand and have all supplies organized before the start of the lesson.
- Use *Scrap cloth planters* from the *Concrete planters* handout for precise instructions on what is needed for the lesson and what activities will be involved.

4.5.2: Concrete and coco fiber pots

Teacher's notes: This is decidedly less messy than using cloth to make pots, but still has its messy parts. Since this requires making a kind of dough, it tends to go a lot quicker overall.

Materials:

- Pot or bowl to use as a mold
- Plastic bags or sheets
- Concrete
- Water
- Coco fiber (must be unbricked)
- OPTIONAL: Spray paint
- OPTIONAL: Dust mask

Procedure:

- Print enough handouts for the proposed number of students.
- For this lesson, invite students to bring their own pots, bowls, or other things to use as molds to make their pots. Have a few extras if possible, in case they bring something that won't work to make a pot.
- Preparing the coco fiber is a great idea if possible. It will reduce the time needed for the lesson.
- Use *Concrete and coco fiber pots* from the *Concrete planters* handout for precise instructions on what is needed for the lesson and what activities will be involved.

Everyone can Grow!

Works cited

- Berkowitz, S. (n.d.). Cleaning cigarette smells with plants. Retrieved October 5, 2018, from <https://www.mnn.com/health/healthy-spaces/stories/cleaning-cigarette-smells-with-plants>
- Borkan, A. (2015, July 9). Should you keep plants in your bedroom? Retrieved October 5, 2018, from <http://blog.casper.com/should-you-keep-plants-in-your-bedroom/>
- Borkan, A. (2015, July 9). Should you keep plants in your bedroom? Retrieved October 5, 2018, from <http://blog.casper.com/should-you-keep-plants-in-your-bedroom/>
- Bringslimark, T., Hartig, T., & Patil, G. G. (2009). The psychological benefits of indoor plants: A critical review of the experimental literature. *Journal of Environmental Psychology, 29*(4), 422–433. <https://doi.org/10.1016/j.jenvp.2009.05.001>
- Brown, C., Besterman-Dahan, K., Chavez, M., Njoh, E., & Smith, W. (2016). “It gave me an excuse to get out into society again”: Decreasing veteran isolation through a Community agricultural peer support model. *Journal of Veteran Studies, 1*(1). Retrieved from <https://journals.colostate.edu/jvs/article/view/64>
- Dela Cruz, M., Christensen, J. H., Thomsen, J. D., & Müller, R. (2014). Can ornamental potted plants remove volatile organic compounds from indoor air? — a review. *Environmental Science and Pollution Research, 21*(24), 13909–13928. <https://doi.org/10.1007/s11356-014-3240-x>
- Drebing, C. (2016). *Leading peer support and self-help groups: A pocket resource for peer specialists and support group facilitators*. S.l.: lulu.com.
- Drebing, C. (2016). *The Peer Specialist’s pocket resource for mental health and substance use services second edition*. lulu.com.
- Lee, M., Lee, J., Park, B.-J., & Miyazaki, Y. (2015). Interaction with indoor plants may reduce psychological and physiological stress by suppressing autonomic nervous system activity in young adults: a randomized crossover study. *Journal of Physiological Anthropology, 34*(1). <https://doi.org/10.1186/s40101-015-0060-8>

Everyone can Grow!

- Lee, M., Park, B., Lee, J., Park, K., Ku, J., Lee, J., ... Miyazaki, Y. (2013). Physiological relaxation induced by horticultural activity: transplanting work using flowering plants. *Journal of Physiological Anthropology*, 32(1), 15. <https://doi.org/10.1186/1880-6805-32-15>
- Leonard, J. (2015, July 2). 12 plants for your bedroom to help you sleep. Retrieved October 5, 2018, from <https://www.naturallivingideas.com/12-plants-for-your-bedroom-to-help-you-sleep/>
- Lohr, V. I. (2010). What are the benefits of plants indoors and why do we respond positively to them? *Acta Horticulturae*, (881), 675–682. <https://doi.org/10.17660/ActaHortic.2010.881.111>
- Lohr, V. I., Pearson-Mims, C. H., & Goodwin, G. K. (1996). Interior plants may improve worker productivity and reduce stress in a windowless environment. *Journal of Environmental Horticulture*, 14(2), 97–100.
- Nosowitz, D. (n.d.). Plants apparently suffer risks of secondhand smoke too. Retrieved October 5, 2018, from <http://www.takepart.com/article/2015/04/15/nicotine-plants-second-hand-smoke>
- Park, S., & Mattson, R. (2009). Ornamental indoor plants in hospital rooms enhanced health outcomes of patients recovering from surgery. *Journal of Alternative & Complementary Medicine*, 15(9), 975–980. <https://doi.org/10.1089/acm.2009.0075>
- Staff. (2015, March 25). Does smoke affect house plants. Retrieved October 5, 2018, from <https://www.professorshouse.com/does-smoke-affect-house-plants/>
- Tomlinson, P. (2018, January 7). Why greenery is in for interior decor in 2018, and how to pick plants. Retrieved October 5, 2018, from <https://www.scmp.com/lifestyle/interiors-living/article/2126797/why-we-should-be-greening-our-homes-plants-top-trend-2018>
- Wolf, C. (2018). *Growing Veterans peer support training*. Unpublished Manuscript.

Everyone can Grow!

Bibliography

- 5 Benefits of houseplants | Bayer Advanced. (n.d.). Retrieved May 7, 2018, from <https://www.bayeradvanced.com/articles/5-benefits-of-houseplants>
- 14 Common plant diseases: How to identify & treat them. (2017, February 15). Retrieved May 10, 2018, from <https://www.proflowers.com/blog/plant-diseases>
- Absher, J. (2017, September 6). VA appeal process updated - Is it a good thing? Retrieved June 16, 2018, from <https://www.military.com/militaryadvantage/2017/09/veteran-appeals-improvement>
- Allaway, Z. (2017). *Indoor edible garden* (First American edition). New York, New York: DK.
- Andrzejewski, J., Baltodano, M., & Symcox, L. (Eds.). (2009). *Social justice, peace, and environmental education: transformative standards*. New York: Routledge.
- Bakker, I., & van der Voordt, T. (2010). The influence of plants on productivity: A critical assessment of research findings and test methods. *Facilities*, 28(9/10), 416–439. <https://doi.org/10.1108/02632771011057170>
- Baptist, K. W. (2002). The garden as metaphor for curriculum. *Teacher Education Quarterly*, 29(4), 19–37.
- Baras, T. (2018). *DIY hydroponic gardens*. Minneapolis, MN: Cool Springs Press.
- Bass, T. (n.d.). For livestock & poultry production, 8.
- Bawden-Davis, J. (2007). *Indoor gardening the organic way: how to create a natural and sustaining environment for your houseplants* (1st Taylor Trade Publishing ed). Lanham, Md: Taylor Trade Pub.
- Benefits of indoor plants - Health benefits of plants to humans | Ambius. (n.d.). Retrieved May 7, 2018, from <https://www.ambius.com/learn/benefits-of-our-services/>
- Boness, C. L., Younggren, J. N., & Frumkin, I. B. (2017). The certification of emotional support animals: Differences between clinical and forensic mental health practitioners. *Professional Psychology: Research and Practice*, 48(3), 216–223. <https://doi.org/10.1037/pro0000147>

Everyone can Grow!

Botany lesson plan. (n.d.). Retrieved April 29, 2018, from

<http://study.com/academy/lesson/botany-lesson-plan.html>

Bureau of Labor Statistics. (2018, March 22). Employment situation of veterans-2017. *U.S.*

Department of Labor, p. 25.

Burke, A. (2016, January 19). You can grow veggies year-round if you follow these simple tips for indoor gardening. Retrieved May 7, 2018, from <http://www.sheknows.com/home-and-gardening/articles/1108731/indoor-vegetable-garden>

Caring for cast iron plants: What you need to know to grow them indoors. (n.d.). Retrieved May 22, 2018, from <https://www.joyusgarden.com/caring-for-cast-iron-plants/>

Carroll, J. (2013, March 12). Caring for potted carrots? How to grow carrot plants in the home.

Retrieved May 29, 2018, from

<https://www.gardeningknowhow.com/edible/vegetables/carrot/indoor-carrot-growing.htm>

Casey, H. (n.d.). Guides: A brief history of civil rights in the United States: Civil rights for the disabled. Retrieved October 15, 2017, from

<http://guides.ll.georgetown.edu/c.php?g=592919&p=4106389>

Cheap and easy \$35 aquaponics / hydroponics setup - YouTube. (n.d.). Retrieved June 11, 2018, from <https://www.youtube.com/watch?v=tKNuoYCdue4>

DePauw, K. P., & Gavron, S. J. (1995). *Disability and sport*. Champaign, IL: Human Kinetics.

Dominguez, L. A., & Schilling, M. L. (2001). Environmental awareness and outdoor recreation: A pilot program for people with special needs. *World Leisure Journal*, 43(3), 42-47.

<https://doi.org/10.1080/04419057.2001.9674237>

Ehowgarden. (n.d.). *How to make liquid fertilizer for a hydroponics system: Hooked on 'ponics*.

Retrieved from <https://www.youtube.com/watch?v=D8c6kU1F7q4>

Elpel, T. J. (2013). *Botany in a day: The patterns method of plant identification* (6th edition). Pony, MT: Hops Press, LLC.

Encyclopedia of house plants. (n.d.). Retrieved May 10, 2018, from <http://www.gflora.com/>

Everyone can Grow!

- Environmental Protection Agency. (2012, December 13). What is environmental education? [Overviews and Factsheets]. Retrieved November 7, 2017, from <https://www.epa.gov/education/what-environmental-education>
- Evert, R. F., Eichhorn, S. E., & Raven, P. H. (2013). *Raven biology of plants* (8th ed.). W. H. Freeman.
- Facts & statistics | Anxiety and Depression Association of America, ADAA. (n.d.). Retrieved June 16, 2018, from <https://adaa.org/about-adaa/press-room/facts-statistics>
- Family Plot. (n.d.). *Building an inexpensive hydroponics/aeroponics system*. Retrieved from https://www.youtube.com/watch?v=_ewOsgoGQL4
- February 2018 veterans disability benefits statistics report. (2018, February 8). Retrieved June 16, 2018, from <https://www.disabilityapprovalguide.com/veterans-disability-benefits/february-2018-veterans-disability-benefits-statistics-report-analysis/>
- Felsten, G. (2009). Where to take a study break on the college campus: An attention restoration theory perspective. *Journal of Environmental Psychology, 29*(1), 160–167. <https://doi.org/10.1016/j.jenvp.2008.11.006>
- FFF: Veteran’s Day 2015: Nov. 11, 2015. (n.d.). Retrieved June 16, 2018, from <https://www.census.gov/newsroom/facts-for-features/2015/cb15-ff23.html>
- Fleming, L. L. (2015). Veteran to farmer programs: An emerging nature-based programming trend. *Journal of Therapeutic Horticulture, 25*(1), 28–48.
- Galloway, W. E. (2017, November 9). Microgreens—The salad you can grow inside any time of the year. Retrieved May 29, 2018, from <https://www.goodhousekeeping.com/home/gardening/a20705635/growing-microgreens/>
- Gardening under grow lights | Gardener’s Supply. (n.d.). Retrieved March 13, 2018, from <https://www.gardeners.com/how-to/gardening-under-lights/5080.html?SC=XNET9012>
- Get a load of our manure guide - Modern Farmer. (n.d.). Retrieved May 7, 2018, from <https://modernfarmer.com/2015/05/get-a-load-of-our-manure-guide/>

Everyone can Grow!

- Grant, B. L. (2012, October 22). Winter growing tomatoes: How to grow tomatoes indoors. Retrieved May 29, 2018, from <https://www.gardeningknowhow.com/edible/vegetables/tomato/growing-indoor-tomatoes.htm>
- Grow citrus indoors. (2011, May 17). Retrieved May 29, 2018, from <https://www.marthastewart.com/332326/how-to-grow-citrus-indoors>
- Growing lettuce indoors, urban gardening: Gardener's Supply. (n.d.). Retrieved May 29, 2018, from <https://www.gardeners.com/how-to/growing-lettuce-indoors/8573.html?SC=XNET9012>
- Growing Veterans. (n.d.). Growing Veterans: Who we are: Overview. Retrieved May 21, 2018, from <https://growingveterans.org/who-we-are/overview.html>
- Haller, R. L. (Ed.). (2017). *Horticultural therapy methods: connecting people and plants in health care, human services, and therapeutic programs* (Second edition). Boca Raton: CRC Press, Taylor & Francis Group.
- Haller, R. L., & Kramer, C. L. (Eds.). (2006). *Horticultural therapy methods: making connections in health care, human service, and community programs*. New York: Haworth Press.
- Harré, N. (2011). *Psychology for a better world: strategies to inspire sustainability*. [Auckland, N.Z.: Dept. of Psychology, University of Auckland].
- Harris, J. G., & Harris, M. W. (2001). *Plant identification terminology: an illustrated glossary* (2nd ed). Spring Lake, Utah: Spring Lake Pub.
- Hathaway, B. (2017, September 28). For suicidal veterans, loneliness is the deadliest enemy. Retrieved June 16, 2018, from <https://news.yale.edu/2017/09/28/suicidal-veterans-loneliness-deadliest-enemy>
- Health & happiness: 10 health benefits of house plants. (n.d.). Retrieved May 7, 2018, from </writing-samples/health-happiness-10-health-benefits-of-house-plants>
- Heartleaf philodendron care - Philodendron scandens. (n.d.). Retrieved May 28, 2018, from <http://www.guide-to-houseplants.com/heartleaf-philodendron.html>
- History of horticultural therapy. (n.d.). Retrieved March 26, 2018, from https://ahta.memberclicks.net/index.php?option=com_content&view=article&id=85:history-of-horticultural-therapy&catid=20:site-content&Itemid=151

Everyone can Grow!

- How to grow ginger indoors. (2018, March 8). Retrieved May 29, 2018, from <https://newengland.com/today/living/gardening/how-to-grow-ginger-indoors/>
- How to grow kale indoors (& mistakes to avoid). (2016, December 11). Retrieved May 29, 2018, from <https://www.sproutabl.com/how-to-grow-kale-indoors/>
- How to grow scallions indoors. (2018, April 6). Retrieved May 29, 2018, from <http://www.theindoorgardens.com/grow-scallions-home/>
- How to identify and control house plant pests | Our House Plants. (n.d.). Retrieved May 7, 2018, from <https://www.ourhouseplants.com/guides/house-plant-pests>
- How to identify indoor garden pests & diseases. (n.d.). Retrieved May 7, 2018, from <http://www.maximumyield.com/how-to-identify-indoor-garden-pests-diseases/2/1430>
- How to make compost tea. (n.d.). Retrieved June 10, 2018, from <http://www.homecompostingmadeeasy.com/composttea.html>
- Human Kinetics (Organization) (Ed.). (2010). *Inclusive recreation: programs and services for diverse populations*. Champaign, IL: Human Kinetics.
- Indoor plant light guide | Our House Plants. (n.d.). Retrieved May 28, 2018, from <https://www.ourhouseplants.com/guides/light>
- International Sprout Growers Association. (n.d.). The history of sprouts and their nutritional value. Retrieved May 2, 2018, from <http://www.isga-sprouts.org/about-sprouts/sprout-history/>
- Japanese aralias, how to grow and care for fatsia plants - Garden Helper, gardening questions and answers. (n.d.). Retrieved May 28, 2018, from <http://www.thegardenhelper.com/fatsia.html>
- Jeavons, J., & Leler, R. (n.d.). Advice on composting dog poop - Organic gardening. Retrieved May 7, 2018, from <https://www.motherearthnews.com/organic-gardening/composting-dog-poop-zmaz84sozraw>
- Kahn, P. H., & Hasbach, P. H. (Eds.). (2012). *Ecopsychology: science, totems, and the technological species*. Cambridge, Mass: MIT Press.
- Kai, J. (2010, November 9). The secret of sustainable living – Top 10 eco-friendly tips. Retrieved March 19, 2018, from <https://www.stevenaitchison.co.uk/the-secret-of-sustainable-living-%e2%80%93-top-10-eco-friendly-tips/>

Everyone can Grow!

- Kim, E. (2003). Horticultural therapy. *Journal of Consumer Health On the Internet*, 7(3), 71–76.
https://doi.org/10.1300/J381v07n03_09
- Kind LED Grow Lights. (n.d.). *KIND LED grow lights reviews | LED grow light comparison | Kind LED vs. other grow lights*. Retrieved from <https://www.youtube.com/watch?v=zluc1OqoS20>
- Kirk, P. A., Karpf, A., & Carman, J. (2010). Therapeutic garden design and Veterans Affairs: Preparing for future needs. *Journal of Therapeutic Horticulture*, 20, 67–77.
- Kramer, J. (1976). *Gardens without soil: house plants, vegetables, and flowers*. New York: Scribner.
- LED terminology – Kelvin, CRI, and luminous flux. (2014, June 12). Retrieved April 22, 2018, from <https://mlites.wordpress.com/2014/06/12/led-terminology-kelvin-cri-and-luminous-flux/>
- Leslie, C. W., & Roth, C. E. (2003). *Keeping a nature journal: discover a whole new way of seeing the world around you* (2nd ed). North Adams, MA: Storey Pub.
- Lighting definitions. (n.d.). Retrieved April 22, 2018, from <http://home.tir.com/~ms/lightingdefinitions/lightingdefinitions.html>
- Lowes. (n.d.). Soil and soil amendments guide. Retrieved April 22, 2018, from <https://www.lowes.com/projects/gardening-and-outdoor/soil-and-soil-amendments-guide/article>
- McMonigle, O. (2013a). *Pillbugs and other isopods: cultivating vivarium clean-up crews and feeders for dart frogs, arachnids, and insects*.
- McMonigle, O. (2013b). *Pillbugs and other isopods: cultivating vivarium clean-up crews and feeders for dart frogs, arachnids, and insects*.
- Michael Langerman. (n.d.). *DIY aquarium of plastic bottle improved*. Retrieved from https://www.youtube.com/watch?v=NDBFHvr_3bc
- Miles, J. C., & Priest, S. (Eds.). (1999). *Adventure programming*. State College, Pa: Venture Pub.
- Miles, S., Fefoame, G. O., Mulligan, D., & Haque, Z. (2012). Education for diversity: the role of networking in resisting disabled people’s marginalisation in Bangladesh. *Compare: A Journal of Comparative and International Education*, 42(2), 283–302.
<https://doi.org/10.1080/03057925.2012.650482>

Everyone can Grow!

- Monster Gardens. (n.d.). *Grow lighting basics - All grow lighting compared education | Best grow light grow indoor greenhouse*. Retrieved from <https://www.youtube.com/watch?v=pyz5RFnhRuE>
- Nhất Hạnh. (2005). *Keeping the peace: mindfulness and public service*. Berkeley, Calif: Parallax Press.
- OrganicFacts. (2013, October 12). 11 Best benefits of sprouts. Retrieved May 2, 2018, from <https://www.organicfacts.net/health-benefits/seed-and-nut/sprouts.html>
- P, D. (n.d.). Create the best soil mixes for your indoor and raised gardens | Off The Grid News. Retrieved April 22, 2018, from <https://www.offthegridnews.com/survival-gardening-2/create-the-best-soil-mixes-for-your-indoor-and-raised-gardens/>
- Peerless, V. (2017). *How not to kill your houseplant: survival tips for the horticulturally challenged* (First American edition). New York: DK Publishing.
- Pell, S. K., & Angell, B. (2016). *A botanist's vocabulary: 1300 terms explained and illustrated* (First edition). Portland, Oregon: Timber Press.
- Perfect Gardens. (n.d.). *High pressure sodium and metal halide: what's the difference?* Retrieved from <https://www.youtube.com/watch?v=TX30MJJV804>
- Petal power: Why is gardening so good for our mental health? (n.d.). Retrieved April 15, 2018, from <https://www.psychologytoday.com/blog/worry-and-panic/201505/petal-power-why-is-gardening-so-good-our-mental-health>
- Phillips, D. (n.d.). Veterans claiming disability pay face wall of denials and delays - The New York Times. Retrieved June 16, 2018, from <https://www.nytimes.com/2017/11/13/us/veterans-affairs-department-benefits-delays.html>
- Pleasant, B. (2005). *The complete houseplant survival manual: essential know-how for keeping (not killing) more than 160 indoor plants*. North Adams, MA: Storey Pub.
- Pojar, J., & MacKinnon, A. (2016). *Plants of the Pacific Northwest coast: Washington, Oregon, British Columbia & Alaska*.
- Pothos plant care. (2017, January 30). Retrieved May 28, 2018, from <https://plantcaretoday.com/easy-care-pothos.html>

Everyone can Grow!

- Preventing, diagnosing, and correcting common houseplant problems. (n.d.). Retrieved May 10, 2018, from <https://extension.psu.edu/preventing-diagnosing-and-correcting-common-houseplant-problems>
- Public_accommodations_disability_rights_state-by-state_Final.pdf. (n.d.). Retrieved from http://adasoutheast.org/publications/ada/public_accommodations_disability_rights_state-by-state_Final.pdf
- Qin, J., Sun, C., Zhou, X., Leng, H., & Lian, Z. (2014). The effect of indoor plants on human comfort. *Indoor and Built Environment*, 23(5), 709–723.
<https://doi.org/10.1177/1420326X13481372>
- Rhoades, H. (2007, May 6). Placing houseplants in your home. Retrieved May 7, 2018, from <https://www.gardeningknowhow.com/houseplants/hpgen/where-to-put-your-houseplants-in-your-home.htm>
- Rhoades, H. (2009, March 23). Chicken manure compost - Chicken manure for vegetable garden fertilization. Retrieved May 7, 2018, from <https://www.gardeningknowhow.com/composting/manures/chicken-manure-fertilizer.htm>
- Rosenberg, D. E., Huang, D. L., Simonovich, S. D., & Belza, B. (2013). Outdoor built environment barriers and facilitators to activity among midlife and older adults with mobility disabilities. *The Gerontologist*, 53(2), 268–279. <https://doi.org/10.1093/geront/gns119>
- Rosenthal, T. (2018a). *Aquaponics 101*. CreateSpace Independent Publishing Platform.
- Rosenthal, T. (2018b). *Hydroponics 101*. CreateSpace Independent Publishing Platform.
- Sabaghnia, Z., Matloobi, M., & Motallebi-Azar, A. (2016). Response of leaf number and plant height of polka pot plant (*Hypoestes phyllostachya*) under various indoor lights. *Agriculture & Forestry / Poljoprivreda i Sumarstvo*, 62(1), 287–294. <https://doi.org/10.17707/AgricultForest.62.1.32>
- Salyer, S. (2017, August 21). ‘Dirt therapy’: Veterans volunteer down on the farms. Retrieved June 16, 2018, from <https://www.heraldnet.com/news/dirt-therapy-offer-help-for-veterans/>
- Simple Organic Gardening & Sustainable Living, MIgardener. (n.d.). *How to make a simple \$3 DIY desktop hydroponic system*. Retrieved from <https://www.youtube.com/watch?v=-s5RD8zkomo>

Everyone can Grow!

Sinha, A. (2014). Slow landscapes of elevated linear parks: Bloomingdale Trail in Chicago. *Studies in the History of Gardens & Designed Landscapes*, 34(2), 113–122.

<https://doi.org/10.1080/14601176.2013.830428>

Soil amendments for organic gardening. (2012, December 8). Retrieved April 22, 2018, from

<http://www.planetnatural.com/soil-amendments/>

Tanielian, T., Jaycox, L. H., Schell, T. L., Marshall, G. N., Burnam, M. A., Eibner, C., ... Vaiana, M.

E. (2008). Invisible wounds [Product Page]. Retrieved June 16, 2018, from

https://www.rand.org/pubs/research_briefs/RB9336.html

The missing context behind the widely cited statistic that there are 22 veteran suicides a day - The

Washington Post. (n.d.). Retrieved June 16, 2018, from

https://www.washingtonpost.com/news/fact-checker/wp/2015/02/04/the-missing-context-behind-a-widely-cited-statistic-that-there-are-22-veteran-suicides-a-day/?noredirect=on&utm_term=.f1434eeee89c

The ultimate guide to office plants. (n.d.). Retrieved March 13, 2018, from

<https://www.ambius.com/blog/the-ultimate-guide-to-office-plants/>

This American Bacon. (n.d.). *How to build a gravity-based PVC aquaponic garden very easily.*

Retrieved from <https://www.youtube.com/watch?v=AaKDQiWYJow>

Turn manure into compost for your garden | Oregon State University Extension Service |

Gardening. (n.d.). Retrieved May 7, 2018, from

<http://extension.oregonstate.edu/gardening/turn-manure-compost-your-garden>

Walter, P. (2009). Philosophies of adult environmental education. *Adult Education Quarterly*, 60(1), 3–25.

Weber, M. (1995). Disability discrimination by state and local government: The relationship between

section 504 of the Rehabilitation Act and Title II of the Americans with Disabilities Act. *36 Wm.*

& Mary L. Rev. 1089, 36(3). Retrieved from <http://scholarship.law.wm.edu/wmlr/vol36/iss3/4>

What is botany? Definition, history & uses. (n.d.). Retrieved April 29, 2018, from

<http://study.com/academy/lesson/what-is-botany-definition-history-uses.html>

Everyone can Grow!

- What you need to know about growing arugula indoors. (n.d.). Retrieved May 29, 2018, from <https://www.thekitchn.com/what-you-need-to-know-about-growing-arugula-indoors-244755>
- Wilson, E. O. (1984). *Biophilia*. Cambridge, Mass: Harvard University Press.
- Woolley, H. (2012). Now being social: The barrier of designing outdoor play spaces for disabled children. *Children & Society*, n/a-n/a. <https://doi.org/10.1111/j.1099-0860.2012.00464.x>
- Worm farm facts - Red worms. (n.d.). Retrieved May 3, 2018, from <http://www.wormfarmfacts.com/Red-Worms.html>