

2020 – The Steps Ahead



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Previous page image: Pilgrimage steps on Wudang Mountain, Hubei Province, People's Republic of China. About 250 miles northwest from the city of Wuhan.

Topics which we are anxious for comment on are in **bold-faced type and highlighted with yellow**. Those wishing to skip all the chatter can simply search for the string /Q.

/A/ Introduction

We consider the daily experiences and life choices available to select spectra of people with special needs to be a disgrace. We aim to provide better health, an inclusive social group, long-term goals in the form of performance-based collegiate degrees and a structured environment for assessing behaviors.

Over many centuries in China thousands of martial arts have been practiced. One group of somewhat similar martial arts probably originated in and around the Wudang Mountains about six hundred miles from the modern cities of Beijing, Hong Kong and Shanghai.



About two hundred miles northwest of the Wudang mountains is the village of Chenjiagou (red star on the map) where the extended Chen family has lived for centuries. Their signature martial art is Tai Chi Chuan (= Supreme Energy Fist). Martial arts typically have different styles associated with them – there are six major secular styles of Tai Chi Chuan, and it is likely the case that all derived from Chen Family style. In Chen Family style in particular there are six leading grandmasters of the 19th generation: Chen Xiaowang, Chen Zhenglei, Chen Yu, Chen Xiaoxing, Wang Xian and Zhu Tiancai. We prefer the books and videos published by Grandmaster Chen Zhenglei. He has been particularly supportive of our efforts to teach people with special needs.

Within most martial art styles there are canonical sequences of movements known variously as forms, sets or kata. In order to fulfill performance-based curriculum requirements for collegiate bachelor's and master's degrees we needed a martial art style with at least 16 sets with published international judging standards. This would be somewhat similar to what a neurotypical Chinese student at a modern sports university would study today were he or she training to become a professional athlete, coach or movie star. Sixteen different forms with published international judging standards are easily accommodated in some of the illustrious "external" martial arts such as Hung Gar or Northern Shaolin. This requirement is less easily fulfilled in the esteemed "internal" martial arts such as Xing Yi Chuan, Bagua Zhang and Tai Chi Chuan.

For the curious, several Taoist monasteries in the Wudang Mountains currently teach what are known as sacred styles of Tai Chi Chuan. A few masters conduct annual teaching tours, and selected members of the public may study at the monasteries. So far, no international standardization of forms, and not enough forms for a curriculum.

/B/ The Novel Coronavirus Problem

As of April 26, there are currently nearly 3,000,000 confirmed cases of the novel coronavirus world-wide with almost 1,000,000 confirmed cases in the United States and 30,000 confirmed cases in California. Unfortunately, there have already been over 200,000 deaths world-wide, over 50,000 deaths in the United States and nearly 1,800 deaths in California. As should be expected, Los Angeles dominates the California statistics with nearly 20,000 confirmed cases and nearly 1,000 deaths. However, the United States has yet to test even two percent (2%) of its population, so confirmed cases and confirmed deaths are likely to grossly under-represent the impact of the pandemic.

We will assume

/1/ There will NOT be a vaccine or a cure available for many months, if ever.

/2/ Currently, coronaviruses are organized in four groups: alpha, beta, gamma and delta.

Although coronaviruses attack a wide variety of animals, previously there were only four coronaviruses that commonly attacked humans: 229E (alpha); NL63 (alpha); OC43 (beta) and HKU1 (beta). A fifth, SARS-CoV (beta), made its international debut in 2002 and caused under 10,000 reported cases and under 1,000 reported deaths, almost all due to severe acute respiratory syndrome (SARS). A sixth, MERS-CoV (beta), is thought to have first appeared in Saudi Arabia. It is still an active disease with over 2500 confirmed cases and almost 900 confirmed deaths. There are no cures or vaccines for any of these human coronaviruses. Nor is there any indication having another coronavirus provides any

immunity.

/3/ The bulk of the population will eventually become infected at least once.

/4/ There is reasonable potential for affordable, accurate and inexpensive testing



/5/ There are well over 30 known strains of the novel coronavirus. It is currently unclear how frequently individuals form antibodies; how long those antibodies are effective; whether one can be infected and re-infected by the same strain; or whether infection by one strain has any influence on subsequent infection by another strain.

/6/ Students will be in one of four statuses

/a/ negative for the virus; negative for the antibodies. Allegedly, this means this individual has not ever had the virus. Of interest is whether they have an intrinsic (genetic) resistance. No one is testing for this - it takes a whole exome DNA analysis using PCR-RT, which is the same technology used to test for the virus.

/b/ negative for the virus; positive for the antibodies. This individual had the disease but has recovered now. This would be typical (eventually) of 90% of people who had the disease.

/c/ positive for the virus; negative for the antibodies - an active case. This individual needs to be followed closely to determine if hospitalization is in order. /**Q1/ Should such a student be quarantined?**

/d/ positive for the virus; positive for the antibodies - this is ambiguous: the individual might be on the verge of having virus density decline (= recovering) or be reinfecting. This individual also needs to be followed closely. /Q2/ Should such a student be quarantined?

/Q3/ Are weekly or perhaps biweekly retests for continued antibody presence sufficient?

/Q4/ What is to be done if a student who had previously tested positive for antibodies produces a negative result?

/Q5/ What is to be done if a student who had previously tested negative for COVID-19 tests positively? In particular, should the class be split between students with antibodies, students with COVID-19 and presumably without antibodies, and students without COVID-19 and without antibodies?

/C/ Transportation

In certain respects, transporting students to and from class in a van has considerable statistical appeal as the environment can be more or less standardized and the travel time could be used for testing. The logistics of arranging pickups and drop-offs, as well as dealing with missed connections and early departures from class, are daunting. While collecting students for the first class and distributing students after the last class could be done with a single group of vans, multiple classes per day would either require a substantial time gap between classes or double the number of vans.

We will assume that students will arrive by a variety of modes: walking, bicycling, public transportation (typically, a bus), a private automobile or some sort of shared vehicle (a van pool, Lyft, Uber and so on).

/D/ Our Typical Daily Class

Activities below with a [G] have their individual movements graded – currently, this includes only Tai Chi Chuan sets, so at this time **not** Qigong exercises, Tai Chi tools and miscellaneous exercises. We also record beverage and snack consumption, undesirable behaviors and any other events required in an individual's education or behavior plan (IEP or IBP). For those who have not had the pleasure, the individual plans are written contracts between a government social services agency, a family and third parties such as schools and service vendors. Our strong preference is that the plan specify one two hour (120 minute) class seven days per week. A class consists of the following activities:

/1/ students arrive; they are routed to four physically separated testing stations where we test for COVID-19. Periodically (see Q3 above), we will test for antibodies. We will endeavor to keep everyone six feet apart.

/2/ Mask checked and hands rinsed with sanitizer

/3/ Released in fours to the corners of the changing room to switch shoes, pants and shirts. As directed, socks as well.

/4/ Note that we will temporarily suspend students checking in using fingertip biometric verification. We have not found facial recognition to work well with masks either.

/5/ optional snack (Eight Treasures rice – explained later)

/6/ In parallel, we account for any missing students – usually by emails and phone calls to parents or guardians

Note that for most classes the students wear traditional long black pants and a long-sleeved shirt in summer or a hooded sweatshirt (leftmost photo below) in winter. We have temporarily abandoned shorts and t-shirts as are often worn in summer. When filming a video to be sent to China for expert review students usually wear semi-formal black cotton uniforms (below center). For formal occasions such as a public exhibition or visits by a master full formal silks are worn (below right).



/7/ a gong sounds; formal bows and salutes between the students and the teacher or teachers

/8/ sitting meditation – WuJi style

/9/ standing meditation – WuJi style

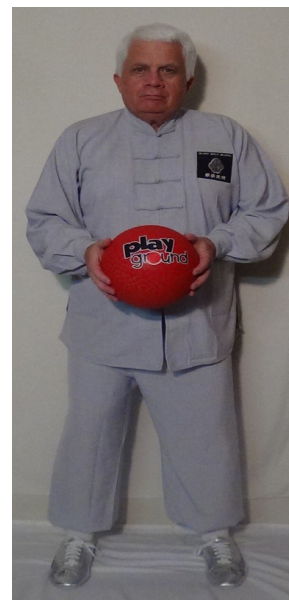
/10/ traditional Chen Family warm-up exercises

/11/ Tai Chi Chuan 18 movements set – repeated twice [G]

For the curious, Grandmaster Chen Zhenglei personally choreographed this set. He feels strongly that it is particularly suitable for our students.

/12/ Eight Brocades (Ba Duan Jin) Qigong exercises

/13/ Tai Chi ball exercises – solid wood ball (on the left) and hollow rubber ball (on the right)



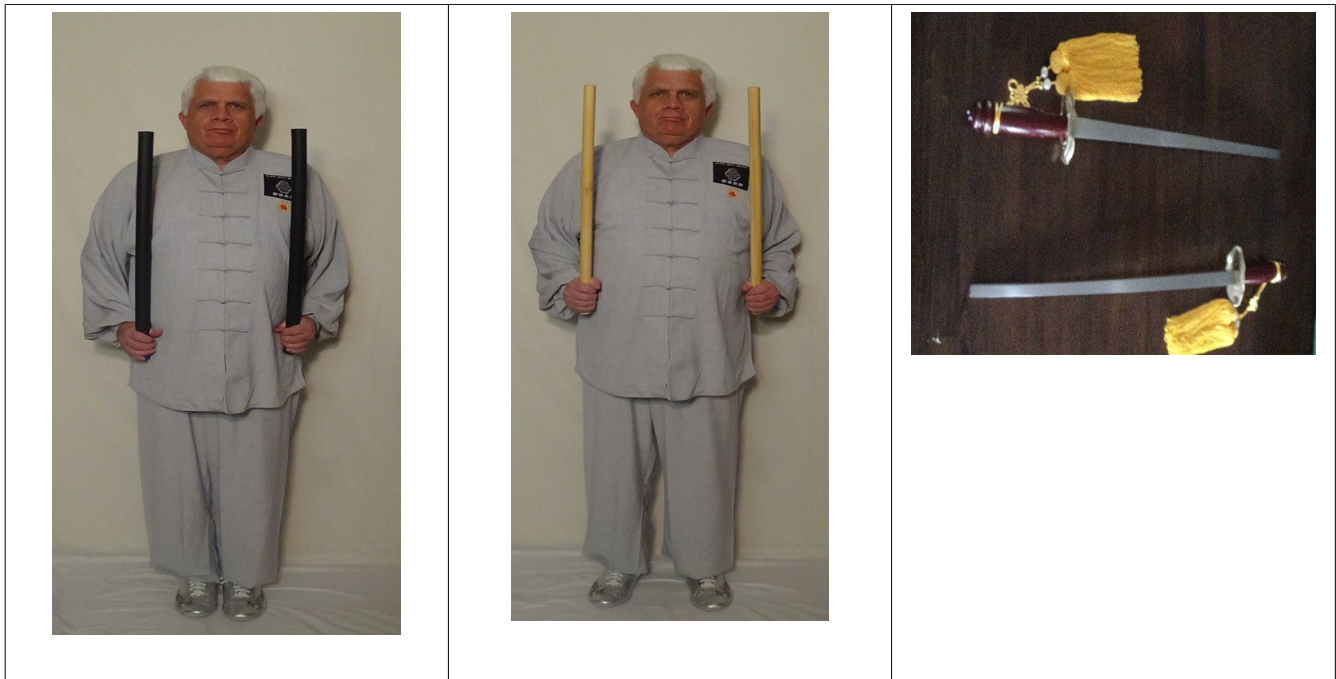
Traditionally, the Tai Chi ball was used to strengthen fingers, wrists and forearms, and was carved from wood or stone. For reasons of safety and economy we use the hollow rubber balls. Our current plan is to wipe off the balls and other classroom tools with alcohol between uses.

/Q6/ Would assigning one particular ball solely to each student be preferred?

/14/ Tai Chi Chuan Double Batons set [G]

Weapons training begins the first day with a single padded baton. Students progress to two padded batons (shown in the leftmost image below) and to two wooden batons (center image below). A student would have his or her own batons to be stored at the school. He or she could certainly purchase a second set for practice at home.

The actual weapon used in fighting was typically a piece of iron with a somewhat square cross-section (rightmost image). Such maces are expensive, dangerous and very difficult to handle effectively, so we use the wooden batons.



/15/ at about 30 minutes – short break for tea or water

/Q7/ We had intended to offer jasmine (green) or Rooibos (red) teas but have come to believe that passionflower, chamomile and lemon balm may offer advantages so in consultation with students, parents and physicians we will provide individual teas.

/16/ Yi Jin Jing (Tendon washing) Qigong exercises

/17/ Tai Chi Chuan Lao Jia (“Old Frame”) set #1 [G]



The Tai Chi Chih or Tai Chi ruler is a stylized piece of wood of obscure origins which is taught in several Chen and Yang style Tai Chi Chuan lineages. It is particularly helpful for students with most types of arthrogryposis and many types of cerebral palsy. Unlike batons, which typically have only one size (all the same diameters and lengths), with rulers students usually come to prefer individual choices for wood and size (length and diameter).

/Q8/ For individual rulers and bangs (another tool) we seek advice on whether students should carry them, presumably in bags, between home and class, or leave them in class.

Generally, ruler dimensions vary with the size of the student's hands (the distance across the palm from the base of the index finger to the medial tip of the pisiform bone) and the distance between the shoulders (distal edges of the deltoid muscles). Most students prefer a highly polished wood with visually stimulating grain.

/19/ Grip ring exercises



These are also particularly helpful for students with an especially painful arthritis-like condition associated with most types of arthrogryposis and many types of cerebral palsy. Individual sets would be stored at school, and a student could certainly purchase a second set for practice at home.

/20/ Tai Chi Chuan single saber set [G] – double sabers shown below left

/21/ Tai Chi Chuan single sword set [G] – double swords shown below right



Sabers



Swords

Generally, the length of the saber and the sword both vary with the height of the student. Some students are very sensitive to the material used to cover the handle. We personally prefer that students practice in class with stiff blades as the flexible blades make a great deal of noise which may annoy fellow students and will definitely annoy the teacher. Our strong preference would be that students keep these weapons in a scabbard and keep the scabbards in a divided bag at school. We appreciate that students might ask their parents for a second set of Tai Chi tools and weapons to be kept at home.

/22/ at about 60 minutes optional snack break (Eight Treasures) – includes water or tea

We have no objections to some customization of the snack – we were primarily interested in eliminating hunger and food anxieties while not interfering with training

/23/ Wu Qin Xi (Five Animals) Qigong exercises

/24/ Tai Chi Chuan Xin Jia (“New Frame”) set #1 [G]

/25/ Tai Chi bang exercises



The Tai Chi Bang is used to strengthen the grip and make wrists and forearms more flexible. It is often helpful for students with an especially painful arthritis-like condition associated

with most types of arthrogryposis and many types of cerebral palsy. Generally, bang dimensions vary with the size of the student's hands (the distance across the palm from the base of the index finger to the medial tip of the pisiform bone) and the distance between the elbow and the first knuckles. Bang exercises are more tactile than ruler exercises: there is considerably more movement of the hands along the bang. Most students prefer a highly polished wood with visually stimulating grain.

/26/ Tai Chi Chuan staff set [G] Chen Family style uses an eyebrow height staff

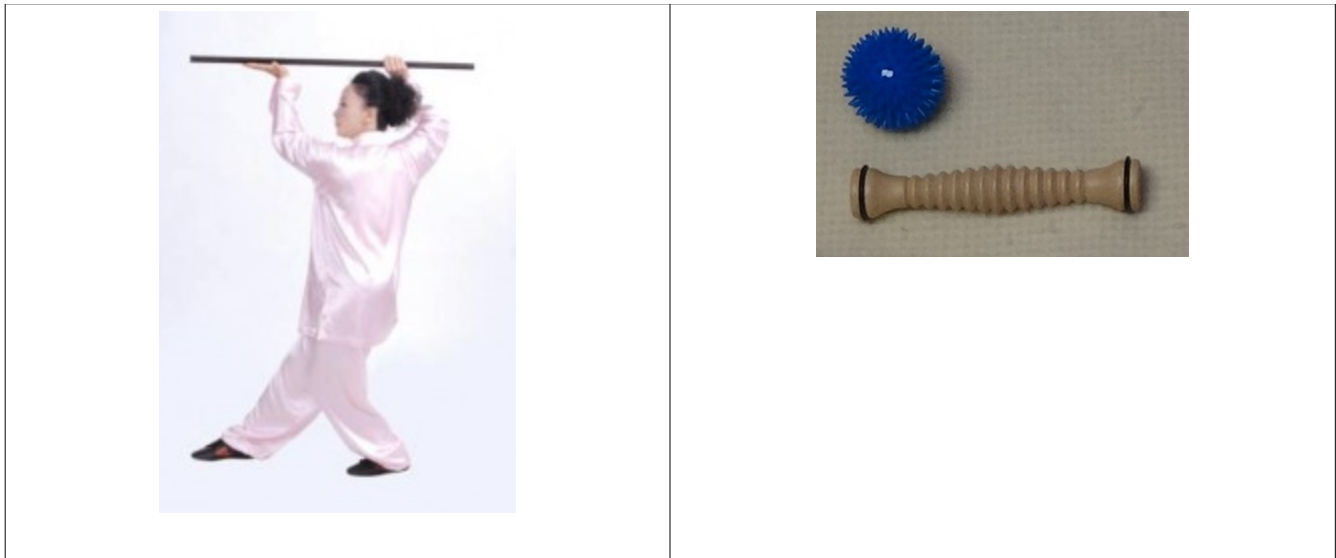
/27/ Tai Chi Chuan spear set [G]

/28/ at about 90 minutes – short break for tea or water

/29/ Liu Zi Jue (Six Sounds) Qigong exercises

/30/ Taiji Yangsheng Zhang (49" stick) Qigong exercises (leftmost image below). Note that some students prefer a carved stick and some students prefer a smooth stick. Due to the length there is much less choice in woods. Also due to the length probably stored at the school.

/31/ Tai Chi bar exercises – with porcupine ball (rightmost image below) for the feet



/32/ Chen Family traditional Silk Reeling Exercises

/33/ formal bows and salutes between the students and the teacher or teachers

/34/ optional snack

/35/ students wash hands and change clothes. School shoes will be wiped by the staff. Clothing will be laundered. No fingertip biometric verification at this time.

/36/ students apply hand sanitizer and depart. Students are welcome to change masks.

/37/ emails to parents or guardians with scores

When students have progressed so that they are largely polishing, as opposed to learning, the first eight sets (as required for a collegiate bachelor's degree) the following material (required for a collegiate master's degree) is gradually added

/38/ Tai Chi Chuan Lao Jia ("Old Frame") set #2 [G] – also known as Cannon Fist

/39/ Tai Chi Chuan Double Saber set [G]

/40/ Tai Chi Chuan Double Sword set [G]

/41/ Tai Chi Chuan Kwan Dao (a halberd) set [G] – see below. These tend to be a single standard size.



/Q9/ The plan for halberds, spears and staffs was to keep a collection for class use and wipe off with alcohol after each session. This may require some thought as the staff and spear are the most tactile of the weapons – there is a great deal of hand movement up and down the length of the shaft. One possibility would be graphite instead of wood. On the other hand, the length of the weapon varies with the height of the student and students sometimes come to strongly prefer certain woods. We currently favor another divided bag to hold individual spears and staffs. We would prefer to experiment with the logistics of

that scheme before asking students to purchase and store individual halberds. As it is, we envision a locker room where students can store weapons and clothing.

/42/ Tai Chi Chuan Xin Jia 2 set #2 [G]

/43/ Tai Chi Chuan Lau Gar Long pole set [G] – see below



This literally is a ten foot pole. It usually has to be practiced outdoors. It is a fairly advanced weapon and we can defer decisions about it.

/44/ The following advanced Qigong exercises are added: Da Wu, Shi Er Duan Jin, Mawangdui Daoyin Shu, and Daoyin Yangsheng Gong Shi Er Fa.

/45/ Tai Chi Chuan Small Frame 108 movements [G]

/46/ Tai Chi Chuan Fork [G] – see below

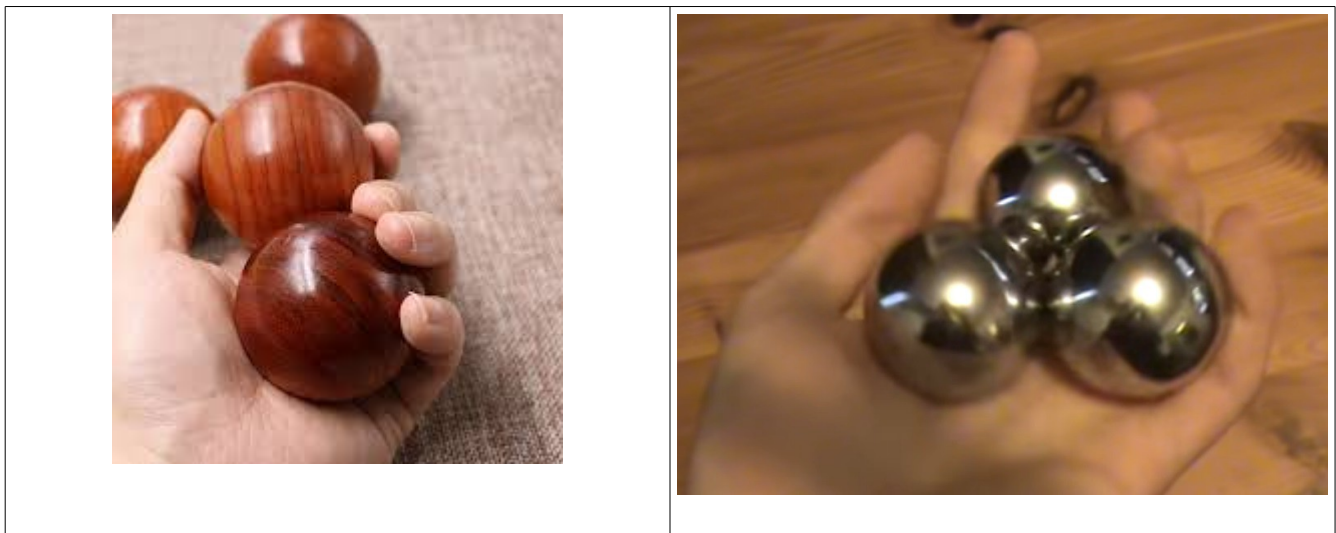


The fork is also an advanced weapon. We would assume any logistics for it would be the same as for the halberd.

/47/ The following tools are added: Tai Chi long bang (leftmost image below), Tai Chi bent bang (center image below), and, from the esteemed martial art of Wing Chun, steel or wooden rings (rightmost image below).



/48/ We are considering adding Baoding ball exercises



/49/ We have been asked about having weighted blankets for both heating and cooling available on the premises – research is underway

/50/ The digital daily scores for each set the student performs are combined into a measure known as the velocity of learning (somewhat akin to a stock index such the Dow Jones Industrials), and are emailed to parents and guardians. The SAITO form to accomplish this looks like (with some redactions)

SAITO - Daily Scores and Pain email



Student Name:

Date:

7/8/2018

Menu

Prior

Recipients:

☒ send to all

Contents:

Both

Pain only

Scores only

Chen,Soter Ming

Macias,Cristina x



Send



What the email contains is the bar chart (lower right) for status at a glance and the velocities of learning for each day. Parents and guardians can request scores for individual sets as well as for individual movements in those sets.

/E/ Our Students

We are primarily interested in students in the arthrogryposis, ataxia, autism, cerebral palsy and Down Syndrome spectra. If someone showed up with something else, wanted to learn and could walk we would almost certainly accept him or her as a student and finesse the rest. We depend heavily on DNA analysis down to the nucleotide level - specifically, which mutation, repetition, or deletion of which of the 2200 genes we currently find of interest. For example, quite by happenstance, we have two students who are both diagnosed with Van der Aa - Helmsmoortel syndrome, which is a type of autism caused by differences in the ADNP gene on chromosome 20. Despite considerable similarities between the students, they had two dramatically different velocities of learning. This is currently attributed to differences in the length (and metabolic effectiveness) of the resulting protein.

/F/ Smart Garments

Those judged to be adept in various Taoist-inspired martial arts, notably styles associated with the Wudang Mountains, often wore and still wear a shawl-like over-garment known as a Pi Sha. Within different Taoist sects there are variations on colors, accompanying hats, meanings associated with the various configurations and colors of the trim materials and so on. The white over-socks and two-toned shoes are characteristic but not universal.



The shortest Chen Family style Tai Chi Chuan set we perform has eighteen movements and the longest Chen Family style Tai Chi Chuan set we perform has one hundred and eight movements. Typically, each movement is given a score from zero (not done at all) to four

(perfect).

Originally, we had planned to embed **location sensors** (computers literally the size of a dime) in the Pi Sha and share perhaps twenty such garments across three classes of sixteen students each. The location sensors would report x y z coordinates five times per second. The students would be watching videos of Grandmaster Chen Zhenglei and would be scored on how closely their movements resembled his.

As elegant, time-honored and colorful as Pi Shas are, they present some serious practical challenges. There is a considerable amount of static electricity – this does not mix well with the sensors. The Pi Shas, possibly by intention, tend to mask details of movement. This is potentially of benefit in a combat situation, but counterproductive in a teaching situation. We also discovered that a Pi Sha acts much like a sail in almost any breeze when filming outdoors.

Accordingly, we currently favor what are often known as sports sleeves. They are lightweight, flexible, inexpensive, readily available, do not appear to trap heat, come in various sizes and can resist washing.



/Q10/ We are leaning toward individual sports sleeves worn over shirts.

/G/ Facial Expressions

At one time we were very interested in correlating facial expressions and emotions. Researchers at the University of California at San Diego School of Medicine were working on the same questions. They were much taken by our notion of a structured, repeating series of events (a daily class) as opposed to allowing patients to do random things. Unresolved was whether some (or even most) students would enjoy anything about Tai Chi Chuan. Neither we nor they managed to detect any repeatable relationships. To be fair, it is not straightforward to ask someone who is autistic if they are happy. There were considerable challenges unobtrusively filming someone's face as they moved about (in our case, faced away from the camera). UCSD eventually abandoned the work. We are not optimistic that there are any fruitful results to be had, but we would not mind restarting the effort.

/H/ Other Sensors

/1/ We were then persuaded by researchers at one of the hospitals affiliated with Harvard Medical School that since head sway is a powerful predictor of falls we should equip students with additional sensors mounted in a cap or equivalent. It is not clear if two locations will suffice or if special sensors known as **accelerometers** will be needed. It is unlikely all falls will be predicted.

/2/ Seizures and similar life-threatening events are not uncommon in special needs populations. In many, but not all, cases blood pressure, heart rate and body temperature all increase substantially before such an event, so we thought it best to have students wear **biosensors** on a wrist in an arrangement similar to a FitBit or smart watch (see below for some examples). We were not surprised that students have opinions about colors, weights, placement (left versus right side of the body; ankle versus wrist), strap materials and functionality. For the most part, we are primarily interested in minimal capabilities as opposed to Internet access, telling time, displaying steps ...



Both Microsoft and Intel have had spectacular product failures in this market: nearly all Microsoft Bands are eligible to be returned for a refund, and the Intel Basis was completely withdrawn long ago. Current trends may be summarized as there will be very low priced commodity devices (\$5 to \$20 – see the image on the next page), medium-priced fitness trackers (under \$100) and smart watches (\$200 to \$300 or higher). We would only be looking for three biosensors, uploading without a tethered phone and reasonable battery life. In our particular case that probably means eight hours, which would be well within the operating parameters claimed.

Fitness Tracker, Activity Tracker Watch with Heart Rate Monitor, Step Counter, Calorie Counter, Sleep Monitor, Swimming IP67 Waterproof Color Screen for Android and IOS, Pedometer Watch for Kids Men Women

by Haokry Smart

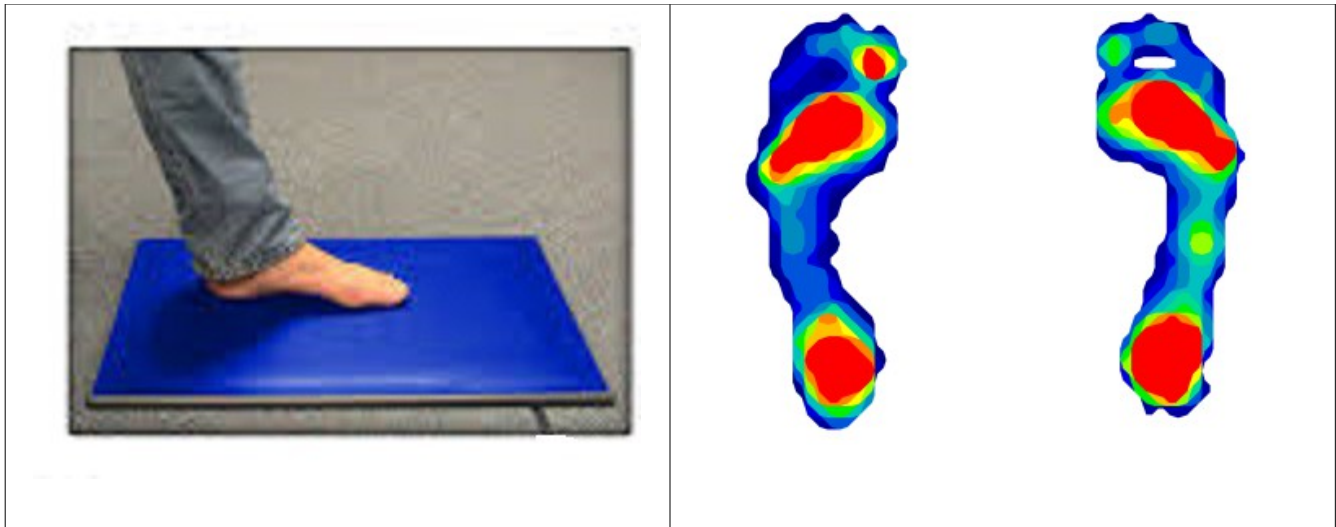
★★★★★ 4 customer reviews | 14 answered questions

Price: **\$16.99** & **FREE Shipping** on orders over \$25 shipped by Amazon. [Details](#)



However, parents may desire a device with more sophisticated functions and something closer to 24 hour or even multi-day battery life.

/3/ In the beginning we had expected to use the first minutes of each class to have students do Wuji style sitting meditation followed by standing meditation before warm-up exercises. Both theoreticians and practitioners of Traditional Chinese medicine as well as Western medicine felt strongly that we needed to measure more than movement. This meant measuring both stillness and balance during meditation. It may be the case that appropriately placed location sensors will suffice. If not, our collection of sensors would likely have to be expanded to include **pressure sensors** in both floor mats (images of feet to the right, although our students would have socks and shoes unlike the image to the left) and seat cushions (lower image).



The initial offerings in the pressure sensor domain from Xsensor cost \$4000 for the stance pad and \$13,000 for the seat pad. We would likely need eighteen of each of these devices to service a class of 16, so we are looking for much much less expensive alternatives.

/4/ We anticipate using **heat sensors** as a way to measure some types of pain.

/I/ Possible new types of sensors – oxygen

Several correspondents have suggested that periodic measurements of blood oxygen saturation levels (oximetry) would be a recommended practice for at least some students. The basic cycle requires /1/ sufficient oxygen in the local air /2/ the ability to inhale enough of that air /3/ hemoglobin that efficiently transports the oxygen /4/ a circulatory system and heart that effectively moves the hemoglobin through the body /5/ the ability to exhale carbon dioxide. A person with an SpO₂ below 90 is at risk of hypoxemia or low blood oxygen saturation. Symptoms include restlessness, shortness of breath, headache, dizziness or confusion. This may be due to an upper respiratory infection (like pneumonia), asthma, heart disease, anemia, ARDS (acute respiratory distress syndrome), congenital heart defects, chronic obstructive pulmonary disease (COPD), emphysema, interstitial lung disease, some medications, pulmonary edema (excess fluid in the lungs), a pulmonary embolism (blood clot in the lungs) or sleep apnea. At present, the relative bulkiness of **oxygen sensors** would indicate that we and students might both be best served if there were oxygen measurements at the start of class, at the two water breaks (30 and 90 minutes in), at the snack break (60 minutes in) and at the end of class (after 120 minutes). We have found zero useful correlations so far. **/Q11/ What is to be done if the oxygen levels indicate a problem.**

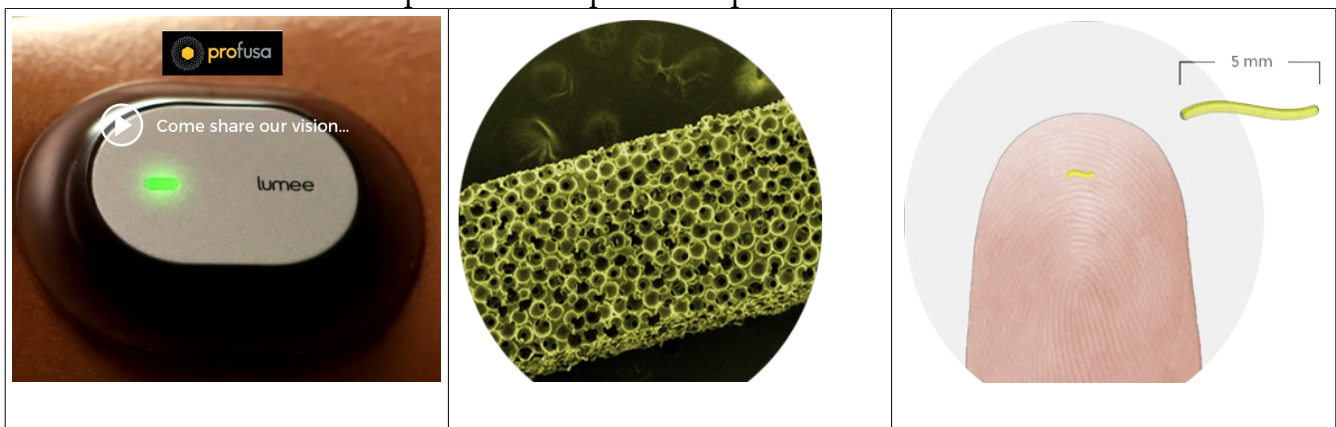
ISTARLINE SpO₂ Fingertip Pulse Instant Read Digital Pulse Oximeter Blood Oxygen Saturation Monitor (Purple) Price: **\$20.01** + \$2.98 shipping



/J/ Possible new types of sensors – blood glucose

A report from the Centers for Disease Control from July 2017 finds that as of 2015, 30.3 million Americans – 9.4 percent of the U.S. population –have diabetes. Another 84.1 million have pre-diabetes, a condition that if not treated often leads to type 2 diabetes within five years. Diabetes was the seventh leading cause of death in the U.S. In 2015. There are fresh hopes every year that some sort of new sensor technology will provide a non-invasive upgrade over the need to pierce one's fingertip twice a day with a lancet to draw blood. So far, no major improvements. Given the possibility in our student population of disastrous diets and lack of exercise, it is disappointing, but not surprising, that there is a very high incidence of diabetes (often with remarkably earlier onsets) in several special needs spectra.

Profusa, Inc. of South San Francisco has announced that they are developing an ultra-thin, wireless, wearable oxygen monitor of particular applicability for patients with peripheral artery disease (see below left). A similar technology (see center below for a closeup of the sensor) for embedding a small **glucose sensor** and detecting its optical signals is also being researched (see rightmost image below). Approvals from the United State Food and Drug Administration and its European counterpart have proven elusive for these devices.



We had had high hopes for the Intel Recon goggles (below left) as well as for Google Glass (below right). At one time Apple was also rumored to be developing smart glasses. Instead of having students, particularly those studying at home, have to cover one or more walls with mirrors so as to be able to see themselves, we wanted to route two video streams to the glasses. Using a camera the student could see a real-time video of himself or herself on one lens and a baseline video of the grandmaster on the other lens. Neither the Intel nor the Google product has remained on the market.



/K/ Lighting and Vision

However, we did discover that some students can hear the hum produced by fluorescent lights. For at least a significant minority of students there is active dislike for the sound and even less fondness for the frequencies of light produced by commonly available fluorescent bulbs. Further inquiries led us to the conditions that used to be known as color blindness. The preferred terms in the twenty-first century are achromatopsia and color distinction deficiency. In humans and in many other organisms there are several key components that all have to work well for visual processing to occur:

- /1/ the regions of the brain that process visual information have to be functional
- /2/ the optic nerves have to accurately transmit information about what the eyes saw
- /3/ the region of the eye known as the retina (in humans located toward the back of the eye closer to the brain) has to collect information and send it to the optic nerve
- /4/ the most important types of cells in the retina are known as rods and cones. In humans, rods handle detection of shapes in dim light while cones are more specialized and more precise – they detect colors. From an electromechanical point of view photons of light strike special proteins in the eye. These proteins react to specific colors of light by emitting an electron which is sensed by cone cells.

In achromatopsia one or more of the three types of cone cells either do not function at all or have only limited functionality. In the various color distinction deficiencies one or more of the optically-sensitive proteins would be either wholly or partially dysfunctional. Currently (as of April 2020) , the state of genetics research when it comes to human vision can be summarized as

/A/ 43 genes are known to be associated with visual processing in humans

/B/ Five of those genes have been associated achromatopsia. So far, this is an autosomal recessive condition which means both copies of the gene (one from the father; one from the mother) have to be defective for there to be symptoms

/C/ there are sixteen genes associated with Leber congenital amaurosis – a dreary prognosis

/D/ there are eight genes associated with oculocutaneous albinism – among other complications, the irises of the eyes lack color and the eyes are very sensitive to bright lights

/E/ three genes – each one associated with a different photoelectrically reactive protein – are linked to various color distinction deficiencies. For reasons still poorly understood, there is a higher than normal incidence of mutations in the OPN1SW gene in the populations we find of interest. OPN is an abbreviation for opsin which is a protein that reacts to light. SW refers to short wavelengths – for humans this means blue and violet light. Depending on the specific mutation one may be unable to distinguish green versus blue, dark blue versus black; blue (partially or at all – so blue objects might appear gray) or violet (partially or at all – so violet objects might appear gray or vaguely reddish).

/F/ For our students there are usually two outcomes: some colors are seen as gray and, for reasons still poorly understood, there is hypersensitivity to glare (typically, an intense white light) and bright blue lights.

/5/ One remedy in some cases are what are known as “blues blockers” (see below). These lenses can be adjusted to reduce blue light as well as glare. If the student otherwise has more or less normal vision such lenses can be purchased for about \$10.



/6/ There are several considerations:

/A/ should a student wear the lenses all day (not just in class)

/B/ what can be done for students already wearing prescription glasses. There may be clip-on supplementary lenses.

/C/ should a strap of some sort be worn to keep the classes from falling off or flying off?

/L/ Upcoming Sensor Industry Events have all been canceled

/1/ Internet of Things World - Santa Clara
Wednesday, May 15th through Friday May 17th

/2/ Sensors Expo - San Jose
June 25-27

I planned to attend both events. A demonstration at an expo does not, alas, guarantee that the product will reach the market. Nor does a demonstration guarantee that the product will remain on the market very long if it does advance to that stage.

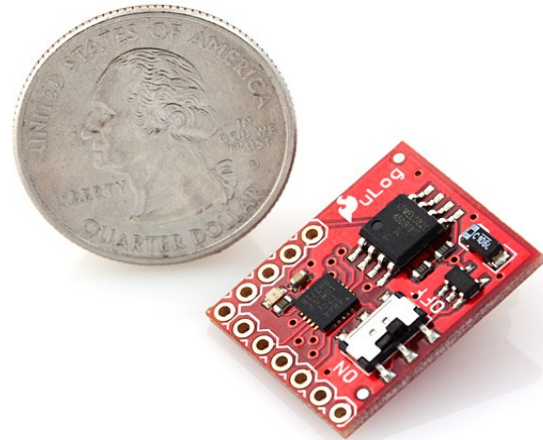
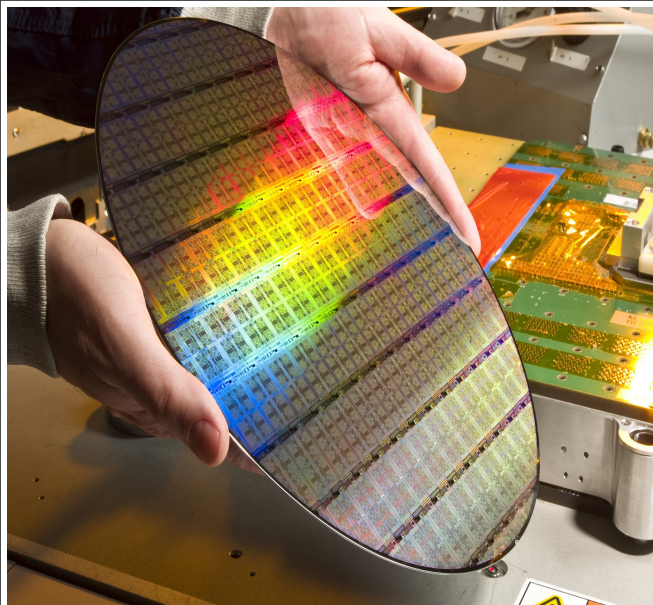
/3/ There was to be a special seminar June 26th by the famed Brewster Scientific on printable sensors.

/4/ ST Microelectronics Developer's Conference – Santa Clara
September 12

ST Microelectronics does an annual tour of several US cities. I planned to attend as STM is a major player. There is no agenda published yet.

/M/ Printable sensors

/1/ Previously, many sensors had been designed and manufactured just like traditional processing units: using lasers and chemicals hundreds would be etched on large silicon platters called wafers (see below left). The individual wafers (see below right – the coin is a US quarter) are then sliced up and the resulting chips are packaged, typically in a metal or special casing.



/2/ Being electrical devices sensors need a power source – typically a battery. The battery must be periodically recharged – one technical objective has been for sensor makers to somehow capture energy from body heat or body motion and transform it to electricity. This would be analogous to a starter and battery combination in most cars where the motion of the car can be used to recharge the battery.

/3/ For us, that means the smart garments have sensors, connecting wires and one or more batteries embedded. For example, two of the red accelerometers shown above would be embedded in a cap approximately above the ears with very thin wires connecting to a small battery either at the crown of the cap or at the back. The battery can be recharged or replaced.

/4/ We can use standard sensors and general configuration for most of our applications. An exception occurs with mounting very impact resistant sensors inside shoes because people have different sized feet.



/5/ For the most part, unless a sensor company is selling in high volumes to a shoe manufacturer, supporting the ordering of single shoe inserts as shown above is not economically practical for sensor makers. However, with a common and inexpensive ink-jet printer, some specialty ink containing titanium, and the material to make the actual insert, an individual customer could print a custom pair of inserts. One suggestion that has already made to us is that we ought to consider printing our own heat and location sensor panels (see below - currently intended for arms and legs). A rough estimate is we might print three hundred (300) per school.



/N/ Electroencephalograms (EEGs)



Neurosky of San Jose California was making an accurate and inexpensive electroencephalogram. We observe a very high frequency of short seizures and believe almost all students should wear an EEG, probably incorporated into a cap.

/O/ Beverages in class – and outside of class

/1/ There have been thousands of emails back and forth about what beverages and snacks might be offered. The current consensus is

/A/ caffeine is almost always contra-indicated

/B/ sugar and most sweeteners should be strictly limited if not eliminated

/C/ there is a need for re-hydration and, to an extent, for micro-nutrient replenishment

/D/ the specific beverages and snacks are likely to be customized for each student

/E/ we would prefer to introduce as little variation as possible

/2/ We had originally intended to offer only water at 30, 60 and 90 minutes with the water being chilled in the summer and warmed in the winter.

/3/ This was soon modified to add water before and after class

/4/ and for there to be water bottles freely available although we would prefer students wait until after a set is complete before drinking.

/5/ The idea was not so much to offer water as a reward but rather to reduce any anxiety about thirst. Bearing in mind considerations like diabetes-driven polydipsia and attention-deficit disorders, it remains to be seen if the arbitrary breaks about every thirty minutes are the best arrangement.

/6/ A series of emails from China from both practitioners of Traditional Chinese Medicine and from martial arts teachers stressed that water, while useful for re-hydration, needs to be supplemented by tea-like beverages. Given the likely problems for some students with gluten and lactose, herbal teas were suggested. For students training at a Taoist monastery, for example, it is typical that the ingredients of the tea vary with the season. In some cases, there is an opportunity to provide some additional medicinal values.

/7/ It is considered unwise to allow students to ingest leaves, seeds or other ingredients, so just a strained or filtered liquid should be served. Four sets serving (below) would be employed for sixteen students.



/8/ Despite admonitions to sip slowly it was rarely possible to pour tea as quickly as one student could drink it. We concluded the teacups were just too small.

/9/ Virtually all of the students (so far) preferred to look at the tea through relatively clear glassware as opposed to opaque crockery. Larger tea “cups” (more precisely, tea glasses) also allowed the tea to gather something of a bouquet or fragrance and to produce an audible sound when being poured.

/10/ Our current protocol is

/A/ students will get a choice of three teas (green or red or yellow) or water



Jasmine tea



Rooibos tea

/B/ We expect to work on brewing temperature

/C/ Likewise, we expect to work on serving temperature as well.

We will want to balance the sensation that the tea, especially in winter, is warm enough to be considered tea, but not so warm as to present a danger of scalding people who might not be able to report being burned, let alone accurately sense temperature.

/D/ We were somewhat surprised to observe that not only did most students appear to enjoy having their tea poured Moroccan style (see below), but that they also wanted to learn to pour that way themselves.



/E/ The more extreme high elevation variation (see below) drew a great deal of attention. We conjecture there is visual, auditory and perhaps aromatic appeal. That students might want to interact with other students is noteworthy. Of interest is whether a student observing others nearby drink various beverages might tempt the student to experiment.



/F/ Upon further investigation in China there is something of a minor art focused on pouring tea from teapots with long spouts.



/P/ Snacks in class – and outside of class

/1/ There was also considerable Trans-Pacific discussion about snacks. One traditional training dish used in the Chen Village for centuries is a porridge made of ground and cooked corn. In America one might describe this as creamed corn. For people with various kinds of Irritable Bowel Syndrome, diverticulitis and other gastrointestinal challenges, corn is a complex issue.

/A/ Generally, the substance of concern is sorbitol, which is typically what makes corn taste sweet. So it matters what kind of corn (sweet corn, popcorn or other) as well as how the corn was processed.

/B/ In some cases corn on the cob is consumable, but it is more likely that popcorn would prove to be safer.

/C/ Corn flake cereals have gotten very mixed reviews.

/2/ A popular suggestion thought to have much wider appeal (and greater digestive safety) than corn is a rice-based porridge known as Eight Treasures Porridge.

/A/ The general idea was to serve a small bowl before class and a small bowl during the break at 60 minutes. Strategically, these would reduce any food anxieties and would start everyone off in a more or less equal condition.

/B/ Eight Treasures Porridge can use different rices – white and brown are most common, but black and red rices have been used.

/C/ There are many published recipes for Eight Treasures Porridge: a casual survey discloses over thirty ingredients. Examples of two combinations are shown below.



Eight Treasures might contain any of the following optional additions:

/1/ other grains like Chinese barley, glutinous rice, millet and wheat germ (gluten problems?)

/2/ red beans, green beans, soybeans, mung beans, kidney beans and peas

/3/ peanuts, walnuts and pine nuts (nut allergies?)

/4/ sesame seeds, melon seeds, ginkgo nuts, dried longan and lotus seeds

/5/ dried apricots, wolfberries, goji berries, pears, red dates and raisins (fructose sensitivity)

/6/ lily buds, Chinese yams and dried winter melon strips

It is to be expected that there will be individual preferences which will depend on what a student wants to eat balanced by what a student should eat and what a student can safely eat.

/Q/ What the five week long partial government shutdown showed

In the future it will probably not be prudent to depend on a steady cash flow from any government – local, county, state or Federal - so each school should strive to have cash reserves.

Likewise, our local utility company imposed a number of power shutdowns so independent generation of electricity (solar and a generator) would be useful. Some thought will have to be given to how to maintain computer communications, especially emails to parents.

/R/ From our Lawyers

For Silver Wolf Wushu the tactical objective would be similar air and water across schools so both can be ignored as significant factors when comparing an individual student day over day as well as when comparing students in different schools.

/1/ Measuring oxygen and air quality

The oxygen sensors were discussed on page 24. At present, no students have an accommodation that requests or requires measurement of oxygen, pollen or dust. It would be reasonable to expect that future sensor events will showcase new products measuring more factors, probably more cheaply, and with wider applicability. For Silver Wolf Wushu there are at least four relevant air technologies:

/A/ Measuring indoor (classroom) air quality – usually devices to do this measure temperature, humidity, carbon dioxide and dust. Some devices directly measure oxygen content as well.



Temtop P1000 Air Quality Monitor for PM2.5 PM10 CO2 Temperature Humidity Indoor Detector Large LCD Display Built-in Rechargeable Battery

by Temtop



6 customer reviews

Price: **\$119.99** & **FREE Shipping**. [Details](#)



- High-precision laser particle sensor and carbon dioxide sensor based on NDIR
- PM2.5 measurement: range: 0-999 ug/m³, resolution: 0.1 ug/m³
- PM10 measurement: range: 0-999 ug/m³, resolution: 0.1 ug/m³
- CO2 measurement: range: 0-5000 ppm, resolution: 1 ppm
- Large display, best for home, office or various occasions, 3000 mAh battery works for 6 hours

/B/ If the students were, for example, being photographed or filmed somewhere scenic or training with lau gar (literally, ten foot wooden poles) or at an extra-curricular seminar that involved javelins or archery, they would be outdoors. There are devices similar to those that measure indoor air quality for such occasions. With the Northern California fires of the last several years in mind, we would likely want to make sure the outside air is safe before doing any outdoors training. We would probably be inclined to get two different devices to cut down on false positives.

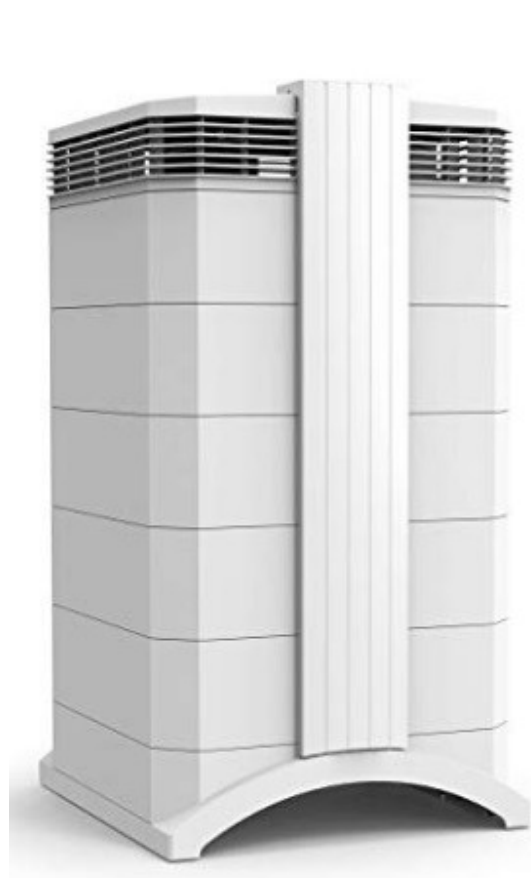
/C/ Individual oxygen monitoring – as noted previously, the most common mode for these devices is to insert a finger into the “reader”. This would be far too cumbersome for continuous use. While students are on break awaiting their tea we could measure oxygen.

/D/ The association of autism and asthma remains unclear. Nor is there any consensus on the association between autism and asthma severity. A recent study in the May 2017 issue of *Annals of Allergy, Asthma and Immunology* examined autism and its effect on asthma and found reduced asthma exacerbations, better results on spirometry breathing tests (better FEV1/FVC ratio and lower odds of airflow obstruction), but higher rates of prescription of asthma controller medications.

/E/ There is little enthusiasm for air conditioning or forced air heating as the belief is that both dry the air, so humidifying the room when heating or cooling has been recommended. This means Silver Wolf Wushu is attempting to remove or reduce the local climate influence so a class in Seattle has the same environment as one in Phoenix. There are diverse opinions about whether one central humidifier and air purifier (leftmost image below) or several strategically placed smaller humidifiers (rightmost image below) will be best. This knowledge may be of use for families: they might choose to humidify their house or perhaps the bedroom of the student. They may also prefer a hybrid unit that both humidifies and filters.

	
Coverage: 2700 square feet	Coverage: 700 square feet
Model: Venta Kuube XL-T Max	Model: Aerus PowerPure™ 5000
Dimensions: 24"w x 12"d x 20"h	Dimensions: 24"w x 12"d x 20"h
Cost: \$1800	Cost: \$200

/F/ The device below is just for air filtration



**IQAir [HealthPro Plus Air Purifier]
Medical-Grade Air [HyperHEPA Filter] -
Allergies, Pets, Asthma, Odors, Smoke,
Pollen, Dust; Swiss Made**

by IQAir



328 customer reviews

Price: **\$899.00** & **FREE Shipping**

- #1 Rated Room Air Purifier for Allergies & Asthma
- Proven Medical-Grade Air Filtration: 100x more effective than HEPA air purifiers
- Only IQAir's exclusive HyperHEPA filters stop ultrafine particles (down to 0.003 microns)
- Stops the smallest particles that exist: 10x smaller than a virus
- Powerful filtration: covers a room size up to 1,125 sq ft (104.5 sq m)

/Q12/ Some questions still being answered

/2/ We have asked for legal advice regarding the following questions:

/A/ Can we declare the interior of the building a smoke free-zone? The tentative answer is yes, although there is a requirement to post a sign at all doors.

/B/ Do we have to provide a smoking room? The tentative answer is no

/C/ Can we decline to hire smokers? The tentative answer is "it depends"

/D/ Is there a recommended and reliable and inexpensive second-hand smoke detector that could be placed in a vestibule? Note that second-hand smoke can involve a student, an aide (who need not necessarily be an employee), a teacher, or someone else such as a social

worker, policeman, or parent.

/E/ If the device detects high levels of second-hand smoke on someone can admittance be denied? Legally, yes. Practically, the situation is complicated – can this condition be "fixed" with a leaf-blower? A vacuum cleaner? A shower? Something else?

/F/ At some point it seems likely someone will want to or need to bring a companion animal. Can we impose a requirement to vacuum the animal before entry to cut down dust?

/3/ If the classroom really does have some sort of air quality problem, what must we do?

/4/ If an individual student is measured with, for example, an SpO₂ of less than 90 we can certainly have the student sit down and we can call parents. As noted, this symptom could be caused by a number of conditions. Is there anything else we need to do?

/5/ We are hoping for no (zero) variations in indoor air quality. Otherwise, we would expect to obtain strong inverse correlations for students with asthma and similar conditions. Note that we are already aware of 28 genes implicated in various conditions in the asthma spectrum.

/6/ We would prefer to quantitatively define asthma symptoms like difficulty breathing, wheezing, breathing through the mouth, fast breathing, frequent respiratory infections, and rapid heart beat. We can certainly measure heartbeats, but whether SpO₂ measurements from oxygen sensors can stand in as a measure of the effects of the various other symptoms will have to be investigated.

/7/ We will strongly encourage students studying at home to control their indoor air quality or at least measure that quality.

/8/ For students traveling to class assessment of outdoor air quality as well as the quality of air within the vehicle presents a challenge. Two asthma specialists have asserted that the meditation time at the beginning of class should easily be greater than any lag in the correlations and that the effects of presumably superior classroom air should be nearly immediate.

However, the asthma specialists cautioned that there might well be noticeable impacts on performance for some students when we do a public exhibition.

We were somewhat surprised that our recent poll regarding plants providing oxygen in or near the training area showed no consensus: 35% thought it would probably be helpful, 40%

had no opinion and 25% were concerned that there might be negative effects (a visual distraction, students eating plants ...). We will add a function to SAITO.

/9/ water quality

/A/ We are primarily interested in drinking water – both for water and tea. If we do serve something like Eight Treasures Porridge water is involved in rinsing rice, soaking dried beans and dried fruit, washing dishes and cooking the actual porridge (six to ten cups needed).

/B/ We are **not** anticipating many showers being taken nor are we anticipating pre-treatment of shower water. Showers are complicated. If one or more students in a van pool are showering after class everyone else has to wait. There may be allergy problems with body wash (liquid soap) and shampoo – we would likely have to ask students to bring their own products and then figure out some way to store the containers. There would also be challenges with changing clothes and dealing with towels. So far, there are very few [anecdotal] reports on problems with different types of towels, but there are so many sensitivities that one more would scarcely be shocking.

The fastest after-class scenario is students change shirts and perhaps socks. Use of deodorant varies widely both due to the student having tactile or aromatic sensitivities as well as other students reacting to scent.

/C/ Sometimes an individual education plan will specify an emergency shower if a student is radically overheating. There might also be showers specified for incontinence, vomiting during a seizure and so on. We would, of course, both for our own sake and for that of the student, prefer to preempt such scenarios, but realistically we will be obliged to clean someone up. When we expand to teaching all day showers will need to be re-examined.

/D/ Currently, renting one or two devices like the Neptune 5000 filtering system (black object with red arrows pointing to it below) seems adequate. These devices rent for about \$40 per month and Neptune takes care of installation, repairs and filter changes.

/E/ students studying at home will likely present considerable analytical challenges when it comes to assessing environmental impacts on learning

Their studies can be in one of three modes:

/1/ they follow a class either live over the internet or on a delay and periodically send in recordings to be graded

/2/ they are registered with us and occasionally send in recordings to be graded

/3/ they are not registered with us



/F/ We will consult with someone knowledgeable about what sort of water quality test equipment would be recommended. Perhaps something like the device below. Note that we would expect to see advances in this technology at the various sensors events.



/3/ Cleansers and similar products – Our current usages are

Surface	Cleanser
floor	Depends on type of floor – see Grove Collaborative
general	multi-surface
toilets	Seventh Generation
showers	Seventh Generation tub and tile cleaner
kitchen (food preparation surfaces)	Seventh Generation wipes
hands (soap)	Seventh Generation
cups, glasses and dishes	Dawn Free and Gentle
spoons, forks, utensils	Dawn Free and Gentle
pots and cookware	Dawn Free and Gentle
laundry	Seventh Generation
Facial tissues	Seventh Generation
Toilet paper	Seventh Generation
Paper towels	Seventh Generation
Paper napkins	Seventh Generation – consider cloth?
Carpet	Rug cleaner?
Lip gloss / balm	Cleure balm with Shea butter
Nail polish and remover	Smith and Cult (clear lacquer)
Toothpaste	Jack and Jill, Cleure
deodorant	Arm and Hammer Essential - unscented
mouthwash	Cleure - alcohol-free

/A/ Our understanding of informed consent is that we should provide this list to parents

/B/ We will need to consider what constitutes sensitivity by a student and what we would to do if someone objects to one or more of the products

SUMMARY

Generally, working with a sample purported to be from the extreme of a distribution presents formidable difficulties in statistics, especially when attempting to infer properties or values that might be associated with a larger, more representative population. Worse, our data is known to have non-linear relationships, manipulated (as opposed to random) variables, and critical variables that are not joint-normally distributed. Eta as opposed to Rho methods are required. Notwithstanding, our use of quantitative sensor-provided data should be applicable to home, work and school environments.

/1/ Air

We intend to monitor air quality during classes: temperature, humidity, carbon dioxide and particles (pollen, dust and smoke) will be measured. The general lack of knowledge about how much of a factor air quality might be is disappointing.

In terms of net oxygen supplementation we have obtained a list of recommended plants from NASA. It is not clear at this time whether the contributions of the plants can be measured.

/2/ Cleansers

We intend to publish a survey from parents about cleansers they use and, equally importantly, what cleansers they do not use. This will be a substantial upgrade to HERON and to SAITO.

/3/ Beverages

We intend to offer students a choice of three types of tea before class, at water breaks (30 minutes and 90 minutes) and at the mid-class snack break (60 minutes) as well as after class.

Originally, the strategy was to always have water freely available and to encourage drinking at breaks, or, at the very least, between sets. The commonly held belief is that the positive effects of re-hydration by any liquid are nearly instantaneous. We have **not** discovered a diagnostic indicator that can be used to determine when a student should drink.

We certainly did **NOT** expect that students would have a strong preference for the Moroccan style of tea pouring, or that students would want to learn how to pour in this manner, or that students would be willing, even eager, to pour tea for other students.

/4/ Food

We will pursue some sort of generic snack with the ability to customize ingredients. Eight Treasures Porridge is a traditional food for martial arts training. In addition to finding ingredients that individual students like either the sight of, the taste of, or the smell of, we, with some help from parents and physicians, will also have to find ingredients that students can digest and will find of benefit. We will have to be mindful of possible reactions by others. A major research item is what effects can be measured and what sort of lag occurs between eating and the effects.

As with air quality, cleaning supplies and water-based beverages, we would prefer to inject as little significant variability as possible.

/5/ DNA testing

We had hoped to locate at least one DNA testing organization operating in most, if not all, United States states. Regrettably, neither Kaiser Permanente Healthcare system nor 23 and Me support the DNA testing we need. We contacted SPARK, which is the autism-based DNA analysis and archive research organization funded by the Simon Foundation. They have a very limited list of genes and are notoriously slow. More than one month for processing is unlikely to be acceptable.

/6/ standard sensors custom-printed by us

We have two outstanding research issues:

A. To measure head sway can we functionally and economically replace accelerometers with x y z position sensors?

B. Likewise, to measure balance between either feet or hips during meditation, can we functionally and economically replace pressure sensors with x y z position sensors?

Currently, we conjecture that a student should have data reporting modules on the sides of the head, the upper arms, the lower arms, the upper legs, the lower legs and the feet. These modules should be both an x y z position sensor and a temperature sensor on a card (a small piece of plastic). There are two distinct audiences – students in a physical classroom and students at home. In the event that no existing and experienced company is able to produce such modules we would consider printing them ourselves under license. We would have to resolve how to supply electrical power and how to securely attach the modules to sports sleeves or other possible surfaces. There are obviously an enormous number of applications

for such modules – many well outside our domain of interest.

/7/ Individual lockers with doors to store clothing tools and weapons

For each student we expect to need to store

/A/ two pairs of shoes in bags

/B/ several pairs of socks sealed in a bag

/C/ a change of clothes sealed in a bag

/D/ ruler, bang, ball, bar and porcupine ball – all in individual bags

/E/ grip rings, a Wing Chun ring, Baoding balls – grip rings and Baoding balls come in boxes.

We are trying to find bags large enough for Wing Chun rings.

/F/ one set of two batons – 26" long

/G/ a zhang (48" wooden wand) - we will use a cardboard tube (with the batons)

/H/ double sabers in a scabbard

/I/ double swords in a scabbard

/J/ spear

/K/ eyebrow height staff

/L/ fork

/M/ kwan dao

/N/ semi-formal black cotton uniform – not sure – perhaps in a cleaners suit plastic wrap

/O/ formal silks – not sure – perhaps in a cleaners suit plastic wrap

/P/ several pairs of daily practice pants and shirts – stored in bags

/Q/ spare specialty items such as masks and gloves – stored in a bag

/R/ towel and handkerchief – stored in a bag

/S/ cap and sports sleeves – possibly the wrist-based sensors as well – stored in a bag

/T/ emergency materials as called for by an Individual Plan