Proposal: Course for Neuroscience of Illicit Drugs

Maria Kesa

The privilege of education and information is a human right. The societal issue that this educational project tackles is illegal substance abuse among minors. The aim is to provide an objective scientific course as a means of reducing the informational gap as one of the underlying reason for indiscriminate drug consumption. The success of the course will be quantified as the developed ability of a teenager to understand scientifically what he is doing to his body, mind and future by choosing to consume illicit substances. The course integrates live and animated video lectures, classroom discussions and educational games to make the material engaging and relevant to the everyday issues that drug consuming teenagers face.

Drug abuse amongst minors is a complex phenomenon. Many of the children who turn to illicit substances have a prior history of social trauma, such as verbal, physical or sexual abuse either by their family members or other external actors. In addition, people exhibit variability in the metabolizing drugs, creating a spectrum of pleasant and unpleasant effects and risk for addiction. There is also variability in the social environment of the child, such as the prevalence of drug use in his or her social network and the inclination amongst his friends to apply peer-pressure. We propose a simple educational solution within this complex interplay of variables. We propose to teach children a practical scientific approach to living life, meaning integrating objective scientific information into considerate daily decision making.

Knowing the methodology of good science and understanding scientific information gives individuals powerful survival benefits. Science extracts information from phenomena through rigorous experiments, which uncover the mechanisms that shape them. In the last decades humanity has gained an increasingly detailed understanding of the molecular and systems level processes in brain circuits. This understanding allows us to characterize the complex phenomena behind psychoactive substance use, e.g. the impact of molecular ingestion on consciousness. It is our sincere belief that the careful work conducted by scientists can be cast into an easy to understand form for children-- through animations, lectures, question-and-answer sessions, discussions and games.

What is the concrete structure of the course? The course will consist of 8 sessions, where half-an-hour is dedicated to a lecture, half-an-hour to discussion and half-an-hour to a game (1.5 hours in total). These sessions are complemented by independent study with computerized learning materials. The lectures are divided into three thematic sections: the Mechanisms of Drug Action, the Effects of Drug Use on the Brain and the Mechanisms of Addiction.

What are the novel strategies that we employ in the goal of educating children about drug use? Firstly, we employ a teaching strategy where live lectures are combined with videos and animations. Many children with behavioral problems suffer from problems with focused attention which limits their ability and motivation to engage with lectures. Computerizing the teaching materials allows the child to replay and pause videos and animations, which provides the ability to structure his or her learning according to her implicit brain dynamics. For example, the child can listen to music intermittently with lectures as a way to rest and restore focus and attention. Replay of videos with the capacity to search the internet for clarification and additional information, permits to strengthen the understanding of the material. At a complementary level, live videos permit question-and-answer loops and give a human touch to the material. Adding personal anecdotes and real life stories to scientific course materials can give real life context to the taught material. Thus, the live and computerized elements interact and mutually reinforce each other, as they target different learning mechanisms in the child’s brain.

Secondly, we employ games in the teaching methodology. Games which develop particular skills in a targeted way can be more memorable and meaningful than simple ingestion of facts through lectures. In fact, games provide an avenue for developing the ability to apply the knowledge learned in lectures. Here we give three examples of possible games that could be employed in the class room. In Game 1, children are paired and given a list of questions about the science of drugs, for example the neurotransmitters that are affected by amphetamine use. The mission given to the children is to answer the questions using Google and Wikipedia. One of the children is called the "Helper" and his task is to assist the other child in searching the internet. For every helpful gesture the "Helper" gets "Karma Points". Later the roles reverse. Before the start of the game, the children draw images of other planets or cities they would like to visit. With "Karma Points" you can buy a trip to a destination of your choice. This game develops several important skills in children. Firstly, it develops the ability of children to search the internet for scientific and health information relevant to their life. This is a key-stone habit for successful modern living. Making informed choices is essential to achieving good outcomes in life. Secondly, it develops pro-social behavior in children, through explicit rewarding of helpful behavior. Thirdly, the target audience for the course are children in closed institutions. An imaginary trip to another planet can lessen the stress of the limit to the freedom to movement.

Game 2 involves dancing and rap. After the children learn about the structure of neurons, the elementary cells of the nervous system, and the chemical and electrical basis of their education, the children are asked to imagine that they are neurons. Standing in a circle the children rap and dance, vocalizing what they are doing and experiencing as they are imagining themselves to be neurons. The target skill of this game is the explicit vocalization of neuroscientific knowledge in an artistic context. It targets imagination and creativity as a way of internalizing scientific concepts.

Game 3 involves simulation of typical social situations elicited in drug abuse. The aim of this game is to simulate the possible consequences of choices. This happens through acting out alternative realities. For example, the main character in the simulation may be given the choice of taking a drug dose from a dealer. The main character then plays out the different scenarios that happen if she chooses to accept or to refuse. The simulations are dynamic with input of the onlookers, who propose what happens and what the main character experiences if he takes this path or the other path. This game trains the ability of the children to simulate the possible consequences of their actions in order to choose the pathway that maximizes their happiness.

Lastly, the sessions contain a discussion section which allows the children to reflect and talk through the taught material. Active engagement with the material is absolutely necessary if the transmitted knowledge is to make a difference in a child's life. An open forum where any question and idea can be discussed is a place where real understanding and value is created.

Finally, all of the developed teaching materials, animations, games and discussion questions will be posted in an organized online webpage in multiple languages, so that any educator can implement the course. Harmful substance abuse is a major issue for society to ameliorate. Creating a resource that disseminates scientific knowledge in a simple and effective way can have a major positive impact on many lives and help solve a social problem.

In summary, we propose a gamified course that combines the best of live interactions with computerized elements, to help children with drug addiction problems make scientifically informed choices in their lives. Making a positive difference in somebody's life through high-quality education is a goal that I personally find the most rewarding in life. Tackling social problems in a constructive way creates value for the present and future generations. Disseminating a successful educational strategy allows many more people to benefit from the approach. I hope that this course holds interest for the World Bank and finds its support.