Learning Analytics for Guitar Players

What does Learning Analytics mean? Having information about student's learning, make the data up, and use the deeper insight (if available ;-)) for formatively inspired feedback and individual adjustments of teaching (of course there are other, more sophisticated definitions of learning analytics, cf. https://en.wikipedia.org/wiki/Learning_analytics). Now, what does that mean for a guitar player?

First, learning is painful. There is no Nurnberg funnel. – I don't know if this concept is clear, it's the primitive 18th century idea that, only if the right technology was available, everything could be filled into human heads, just like through a funnel. We know that this is nonsense. So, there's *the Dan Plan* (http://thedanplan.com/). Dan McLaughlin, 34, US citizen, decided in April 2010 to quit his job as a photographer and, with zero previous experience in the game, dedicate 10,000 hours of practice to golf. Half way through, he now has a handicap of four, which is quite good. Now, what does that say? It means, learning is painful, learning takes time, and learning cannot be 'perfectionalized' through technology or learning analytics. It means that, many psychologists say that it takes 10.000 hours of practise to become a master in …., whatever, a golf player, a chess player, a biologist, or a musician.

This is a bit frustrating for a learning scientist, for the guys seeking for new and cool technologies to support learning and teaching. Based on all my experiences as a learning psychologist in the past 15 years, it is absolutely clear: Most often the claim that technology per se could improve learning is bull…., humans have a certain, individually varying capacities to learn new knowledge or motor skills or whatever. No technology on Earth can change this. The only thing we can do is to optimize the potential. This, however, requires more than mere technology, this requires didactic ideas; ideas such as making teaching / educational measures as individual as possible. Ultimately, this is what the broad research fields of adaptive / intelligent tutorial systems are after. This is what Learning Analytics attempts and formative assessment and feedback want to achieve. In the end, there is little to no (scientifically serious) evidence that this works – so far. There is even a 'non-significant difference effect', a running gag among learning scientists, meaning that whatever technology you use, tablets vs. textbooks, movies, vs. audio, in the end, it doesn't make any difference for the learning outcome. Woah! Now what can we do to meet all the ambitious ideas and wishes?

More importantly, how does all that translate to a guitar player?

Imagine you want to learn playing the guitar. Imagine you are supposed to learn Johann Sebastian Bach's Chaconne from Partita in D minor (check it out at https://www.youtube.com/watch?v=SI8U33x51zM, a must!). It will take 10.000 hours! Technology can mean that you are learning to program computer software which is playing this piece for you. That's not what we want! But often, this is what technologically driven concepts aim at, or are limited to. That's far from being innovative or being effective. So what are the things that support the guitarist?

(1) **Access!** The first and foremost thing is to provide learners with access to the materials they need to learn. Sounds easy, but it is not as easy as 'Moodle'. If you allow a guitar student to

access all the great music available (such as Bach's Chaconne) she will try. And even if the beginning is doable, as it is in the Chaconne, it quickly gets so hard and difficult that the student cannot master it – no way! What should be the didactic correct answer? Hiding this piece of music? Definitely not, it's a key motivator, a level that could be reached - someday. But, access means to provide educational materials at all stages, perhaps just to try it, perhaps just to fail, just to provide a goal, perhaps just to show how far one could come! And certainly access means, to manage to provide access to all the sheet music, of Bach, Paganini, or Nikita Koshkin (check it out, it's way cool: http://www.bing.com/videos/search?q=nikita%20koshkin%20michievous%20prince&qs=n&form=QBVR&pq=nikita%20koshkin%20michievous%20prince&sc=0-0&sp=-1&sk=#view=detail&mid=3F39870C40B483596A043F39870C40B483596A04). But that technically trivial and business of all the well-known learning management systems, from Moodle to Khan Academy. For the guitarist this means access to all the freely available sheet music and portals like Songsterr (http://www.songsterr.com/). This way of accessing information is key, however, without support; hardly a person will be able to achieve mastery. Just from seeing all the music notes or guitar tabs, hardly a person can achieve mastery. It takes more, apparently.

(2) **Decisions!** The second aspect is to grant learners, guitar students in our case, with the right to decide what to learn. When the goal is to learn playing the guitar, one can do that in the classical way, playing Bach or perhaps Mauro Giuliani (https://www.youtube.com/watch?v=ncuBEwwM4Io), perhaps Francisco Tarrega (https://www.youtube.com/watch?v=SHNOUPmkFlI), or completely different using the cool, Heavy Metal guitarists as a role model, e.g. Paul Gilbert (https://www.youtube.com/watch?v=HC60XNiS-MQ). Although the music and the style is so very different, it leads to the same goal, mastery in playing the guitar. So, for educationally smart technology this means supporting a identification and decision process. Everything is available at YouTube. The first and foremost problem of today's students is to find the right role models and the right style. Supporting this 'search process' is not trivial and requires a massive understanding of the learner's preferences and styles. It is extremely hard to decide what the best piece of music would be, for a particular learner to continue to learning process towards mastery. This point requires a very good (and fully comprehensible educated and experienced) teacher or very smart recommendation algorithms similar (but way better) than the commercial recommendation systems, which are for example used by companies like Amazon.

(3) **Hang in there!** Mastery takes (about) 10.000 hours of practise. – This sucks! – But it's unavoidable, I'm afraid. ☹ Thus, a key task of pedagogy, and in the particular case of educational technology, is to support the continuous engagement and commitment with learning tasks. One approach to that is 'gamification', a more or less simple concept that considers the role of competition as motivator for learning. This works, to a certain degree, yes. Learning analytics, however, must do more. Learning analytics must identify (oftentimes deeply hidden) achievements and provide the key information about progress and competition to enable concepts such as 'gamification'. Only if this progress and achievement feedback is evidence-based and credible and real, it can have an effect for learning motivation and the adjustment of educational measures. Moreover, smart technology must

be capable of describing theoretically desired and practically achievable learning goals; and technology must be capable of highlighting the discrepancies between them. In an ideal case, this technology can provide very concrete answers to that, on a competency level.

(4) **Reflect!** A central aspect of each educational measure is assessment, appraisal, and evaluation. Teachers as well as learners must reflect on the learning progress, the achievements, the strength, and weaknesses of the learner. This, however, is not as straightforward as it may seem at first sight. It's not about using more or less always the same standard test items or task which are identical for all learners. It's about tailoring assessment to individuals – where the key point is to identify the fine grained details of available competencies and to identify the concrete competence gaps. Only this careful view allows finding the right measures to proceed along the learning curve. In terms of the guitar player, this means, once you can identify that your little finger of your right hand is a millisecond too slow and that this causes timing inaccuracies and in the end wrong notes in a guitar solo, then the guitar player can work exactly on that. Sometimes it's just to find out that the fingernails of your right hand are a touch too long for a certain picking pattern. A rough and superficial assessment cannot make the job. It needs a good teacher, a good analysis to find the problems and to recommend the appropriate next learning steps. This makes the great teacher. Learning Analytics can make exactly this job. It's a smart analysis of all available information, even if the important information is so fine grained and pale that it is really hard to find with the naked eye. Check this out to see what I mean: https://www.youtube.com/watch?v=i_7feGF9TA8 or check this out https://www.youtube.com/watch?v=lwF6DO9I7Sw. Riding the learning curve towards this mastery, it needs a lot, a lot practise, but also a lot of information about what and how to practice! And this is why (on a certain level) a guitar teacher and the student sit together for hours trying to find all the not 100% accurate tiny little micro-flaws. Only with 'learning analytics' (and a looooootttt of talent) you can reach this: https://www.youtube.com/watch?v=-DMyM7ARJUI.

(5) **Think differently!** Learning, practising, getting better in something – all these are so very individual tasks. It requires talent, social, cultural, and economic environment, personal attitude, and God knows what else. And it doesn't matter if we are talking about the guitar player or the primary school kid. Improving very often mean trying different things, different ways of learning, different modes, different tools, different techniques, perhaps different domains. Ideally, this (self) discovery is guided by solid information or at least educated guesses what to try. Learning Analytics can help to make those educated guesses in form of recommendations of new learning objects, learning styles, new learning domains, or perhaps new learning goals. And, even if a kid always wanted to be a classical violin player, with the right guidance at the right time, this kid could end up here: https://www.youtube.com/watch?v=GBwZ69L6v0w.

(6) **Competition!** Very often, the term competition is not well received in the context of learning. Once it is called gamification, it sounds more convenient. But in the end competition is a key characteristic of human beings. And, even if there might be gender differences, children of any age love to compete with each other. Check this out: https://www.youtube.com/watch?v=XvGTOWG1_Tk. Now, what learning analytics can do is

to provide objective, transparent, traceable, and above all, evidence based evaluation / grading of achievements, in a statistical sense but also in a non-numerical, stochastic, competency-oriented sense.

(7) **Confidence!** Confidence is important, perhaps the most important thing in the world. If you are a star with loads of talent, it's easy, but sometimes, you are not the most gifted person in the world. If you feel good, if you believe in yourself, if you see and believe in progress and success, it's all fine. Then you can make the most of it. And this is the trickiest aspect of Learning Analytics, maybe. Learning Analytics, on the one hand, can x-ray a person and compare this person to many others, Learning Analytics can make predications of success, and can look into the crystal ball. But Learning Analytics has a massive responsibility. There is an endless array of ethical aspects, privacy, data protection, and fairness. Yes. And we all wish that analyses are used for good. But there is more to that. Learning Analytics tools can provide perspectives and guidance. They can make up data and display them in a way that one's personal 'event horizon' is visible and that it feels reachable – in a positive way, tailored to the individual person. So proper Learning Analytics (ideally) would inform this guy (https://www.youtube.com/watch?v=qTfKTKGyJIs) that he could be great painter, and that he can learn to make music on a satisfying hobby level; but with the clear recommendation not to attempt becoming a professional musician.

What I tried to summarize in the words of a guitar player and with a lot of cool examples on *YouTube*, is that Learning Analytics has the potential to make education, schooling, learning, tutoring, ….., much more effective. In the world of guitar playing (at least on a high level), it's clear that everything is about those fine little details that make the difference. If I know that I should shake my ring finger of my right hand for 2 minutes with 200 bpm (beats per minutes) as an exercise, than I can make some headway. If you are a guitar student, very likely, you receive one on one tutoring. With a personal tutor, of course, those measures occur naturally but they are highly time consuming. Translating this scenario to the regular educational sector, it's clear that technological solutions are required to support teachers and instructors to achieve this level and granularity of teaching for 10, 20, maybe 100 learners. This is what Learning Analytics solutions can do. Not more and not less.

And me - even if I can't achieve this https://www.youtube.com/watch?v=ADwfyxpriAM, maybe I can contribute to the development of next generation Learning Analytics solutions that really support humans in learning and getting better in … whatever.