# PLOTLearner's Persuasive Achievement: Force, Flow and Context in Technology for Language Learning from the Hebrew Bible[1]

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**Abstract**: Kierkegaard's manifesto for the art of helping focused on finding persons where they are and bringing them to the goal. This is also the goal of the learning technology PLOTLearner developed by EuroPLOT (www.eplot.eu). Using the text database of the Hebrew Bible from the Eep Talstra Centre for Bible and Computer (ETCBC) in Amsterdam, it offers both a simulation of Hebrew grammar and a tool for training language skills. The intended achievement is adapting to the context of learners while the corpus persuades learners to engage with persuasive forces that take them into the flow of learning.

Using B. J. Fogg's *Computers as Persuasive Technology* (2003), this paper presents the achievement of PLOTLearner in terms of persuasive functions, intrinsic motivation and potential outcome for learners. First, it refines persuasive principles by distinguishing between persuasive content, force and outcome, applying core distinctions from Searle's Speech Act Theory. The persuasive principles subdivide into enablement and motivation, plus four orders of enhancing persuasive force. Secondly, Mihalyi Csikszentmihalyi's theory of intrinsic motivation in flow developed into a new RAMP model inspired by Andrzej Marczewski, driving persuasive learning into a flow towards Relatedness through Autonomy and Mastery, once there is a commitment to Purpose. Third, the four core contexts for PLOTLearner are four expanding spaces which are learning objects. self-direction of learners, institutional facilitation, and social world.

The strength of this open source technology is its ability to be repurposed to any corpus, language and learning culture. This is also its weakness, because flexibility calls for well-trained facilitators of this persuasive learning.

**Keywords:** Persuasive learning technology; flow; Hebrew Bible; learning context

## The secret of achievement in learning

Søren Kierkegaard whose birth two hundred years ago has been widely celebrated in Denmark in 2013 wanted to change the attitude of his contemporaries towards shallow Christianity. In his concluding summary on the goal of his authorship he points out that Socrates had influenced him to formulate his pedagogical manifesto:

> If One Is Truly to Succeed in Leading a Person to a Specific Place, One Must First and Foremost Take Care to Find Him Where He is and Begin There. This is the Secret in the Entire Art of Helping. (Kierkegaard 2009: 45).[2]

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[1] This paper was originally presented at the Society of Biblical Literature Annual Meeting in Baltimore in 2013, as well as in Danish as the inaugural lecture for the professorship on Hebrew Bible and ICT on August 13, 2014.

[2] Thanks to Jacob Olsen for reference to the English translation.

Two hundred years later the European Union Lifelong Learning Project EuroPLOT[3] is investigating how persuasive design can enhance technology for learning to influence learners. Without the personal costs paid by Socrates, or Kierkegaard's fury in his battle against the church establishment, the manifesto still challenges us to develop an art of facilitation that will find learners where they are and bring them to the intended goal.

Designing for information- and communication technology in a new age, we applied the theoretical framework emerging out of B.J. Fogg's *Computers as Persuasive Technonlogy* (2003). Out of his research on how computers can act as persuaders in changing our attitudes and actions has grown a live research community with annual international conferences on Persuasive Design that contributes to current developments in digital technology for business, health, and social services, and now also for learning.

In our application for the EuroPLOT project, we wanted to explore how this theoretical framework could help us develop a new theory, method and practice for persuasive learning. Six partner institutions from four countries in Europe developed Persuasive Learning Objects and Technologies (PLOT) through funding from the Education, Audiovisual and Culture Executive Agency (EACEA) of the European Commission 2010-2013. The project has delivered two new applications, PLOT-Maker and PLOTLearner, and deployed and evaluated them in four different cases for persuasive learning of language, culture, business IT, and environmental risks.

It is now time to mock-up on and summarize what we have achieved and learned in the project. This paper presents our unique approach to the development of persuasive technology for language learning from the Hebrew Bible. This work was carried out in work package 5 (WP5) by Nicolai Winther-Nielsen as scientific coordinator, designer of learning and gatherer of test data, while researcher Claus Tøndering developed the program, and Judith Gottschalk and Christian Højgaard served as student assistants.

This paper will introduce the main achievements of the PLOTLearner project in relation to persuasive force motivational flow and context adaptation. After a review of the debate on the force of technology in the project, this paper will pursue three lines of enquiry: First, it will apply notions from Speech Act Theory in order to distinguish force form content and outcome, and then describe how four enhancing orders of persuasive force divides into enablement and motivation. Second, it will apply theory on intrinsic motivation through flow through the research of Mihalyi Csikszentmihalyi and the experiments of Deci and Ryan to Andrzej Marczewski's proposal to combine relatedness, autonomy, mastery, and purpose as the four acronyms in a new RAMP model. The achievement here is that it explains very well the function of persuasive force of flow empowered through the PLOTLeaner mechanics with its persuasive triggers. Third, we will define contexts for PLOTLearner as four expanding spaces of learning objects, self-direction of learners, institutional facilitation, and peer-collaboration in a social world.

Hereby Kierkegaard's search for the reader can begin and the first step into persuasive learning take place.

## The challenge of Persuasive Achievement through Technology

Conflicting views and fundamental disagreement are bound to emerge in the Information- and Communication Technology sciences, because the rapid evolution of new technology is by now developing with a speed that constantly changes the fields and its central issues. This is also the case in the

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[3] See the project hompage at www.eplot.eu

EuroPLOT project, with its aim to apply the theory of Persuasive Technology, or Persuasive Design (which is by now a more common label), for development of new persuasive learning. What may have seemed like a novel idea five years ago can easily be overtaken by competing frameworks and new solutions in a field where computing power used to double every 18 months, but now is reaching new heights in the cloud.

EuroPLOT has fared no different in this regard. Even after three years, our research question has not found a final and unified definition, as is clear from the International Workshop on EuroPLOT Persuasive Technology for Learning, Education, and Teaching (IWEPLET 2013) in Paphos on Cyprus September 16-17 2013. The proceedings volume edited by Behringer and Sinclair (2013) contains papers by project partners, which clearly plot two main diverging tracks through the project. The first major track focused on how new contexts for learning can influence the use of an existing technology, minimizing the role of the persuasive design. The second major track focused on how design and technology can enhance the reuse and repurposing of the learning content generated by older technology or designed for development in EuroPLOT. At the same time new technologies are created and taken into use in order to develop the field.

To be more specific, out of the first track grew a new kind of contextual learning through mobile learning objects created in PLOTMaker in order "to allow users to overlay digital sight, sounds and interactions onto the physical world" (Smith and Chinnici 2013: 10). Using emerging technology for virtual and augmented reality, this new approach locates persuasive learning in the intersection between a learning content and its context, dynamically manipulating the physical context as a learning space, Stipulating that contextual assumptions are a prerequisite for any successful persuasion, this track in the project implements Kierkegaard's focus on finding learners in their context. Smith and Chinnici on this background points out that no technology will persuade users if it is not applied within an intended use context. Furthermore, they envision a radical new approach to persuasion in context that will generate a fluidity of thinking from movement within this particular context. This kind of spatial manipulation of learning in an actual physical space can even scaffold language learning, when visual memory and location is embedded in a tour on learning German, Spanish, Italian and French (Smith and Chinnici 2013:16).

Hence, this track of the project focused on developing context engineering with location-based technology in order to learn from the texts and culture of a Danish poet, play-wright and pastor Kaj Munk who was brutally assassinated by the Nazis on January 4 1944 (Grund-Sørensen, Gram-Hansen, and Øhrstrøm 2013; Gram-Hansen, Kristensen and Gram-Hansen 2013). Especially Gram-Hansen (2013) has explored how human persuaders can use the appropriate time, location, and manner to increase persuasive engagement for learning, but in her view of the technology nothing more was added than "a reflective meta-layer to existing design approaches" 2013:73).

On the other hand, the second track in the project has focused on plotting persuasive functionality of technology beyond the role of a human persuader. Working with the deployment and evaluation of the new PLOTMaker authoring tool, two cases focused on learning in exposure scenarios for toxic substances and databases. The first case explored the potential in integrating persuasive technology with other tools and using the learning objects for self-assessment and simulation in the industry (Winther-Nielsen and Carstensen 2013: 31, 33). The second case explored persuasive affordance, deep learning, scaffolding and self-monitoring for higher education based on PLOTMaker (Soosay and Mikulecká 2013: 39-40). Just like the case at hand for learning Biblical Hebrew from a corpus, this track in the project has focused on plotting the persuasive effects embedded in the learning resources and documenting this in surveys (Herber 2013: 61). In Kierkegaard's terms, this track has

focused on successfully bringing a learner to the intended and specific goal, probing into the efficiency for motivating learners and effectively enabling learners to acquire new skills. In this track, the exposure and database cases treated context primarily as the matter of a socio-economic environment and the educational setup of learners and their personal goals. The explicit aim for these two cases in track two was to give teachers resources through which they could enhance use, encourage reuse and create open educational learning objects.

The Hebrew case was specifically designed to evaluate the new PLOTLearner technology developed by WP5. It explored repurposing of Hebrew learning into the PLOTLearner format by teaching assistant Christian Højgaard,[4] but it did not explore any mobile learning for context engineering. In another world with better funding, it would have been helpful to explore a physical location-based learning of Biblical Hebrew in Israel. It is no doubt also possible to find physical spaces suitable for learning on the Hebrew Bible outside the Holy Land, if we turn to biblical motifs in church and synagogue art or artifacts from the Ancient Near East in archeological museums. However, this work-package defined a database corpus as the main object of learning, and our main interest was therefore to support motivation for persuasive practice and enablement in the learners' pursuit of personal goals and tasks.

At the outset of the project it was envisioned that learning objects and technologies could create persuasive effects, but this was seriously undermined by a claim that PLOTLearner provided "no new perspectives to the further development of the technologies" (Gram-Hansen 2013:74). Given this serious challenge, this paper will argue for one of the two answers that can meet this serious allegation. We are going to present the case for WP5 offering a new perspective on the reuse and repurposing of corpus-driven technology for language learning. The second answer to the allegation will not be elaborated here, except for reminding the reader about the fact that throughout all three years, the Hebrew case focused on developing, testing and documenting new persuasive learning effects for fun, competition and collaboration, and the evaluation data provided overwhelming proof of these positive effects (Winther-Nielsen 2013a, 2013c).

The following is therefore our reasons for postulating that persuasive technology eases the reuse and repurposing of technology with force and flow for learning, triggering language acquisition in the pertinent contexts.

## Force: Applying Persuasive Principles

From the outset, WP5 planned to explore to what extent persuasive learning objects and technologies for Hebrew language learning could take over the functions of a persuasive teacher. We wanted to achieve what Cobb (2006) has defined as delivering the teacher with the text, but at the same time to invest this teacher presence in the text with stronger persuasive power for learning. The following explains where we started and what we did in order to implement persuasive technology.

As early as 2004, several learning programs had been developed for use in the Hebrew classroom, among those a predecessor to Paradigms Master Pro for Biblical Hebrew and Greek as well as Spanish.[5] In the class-room it emerged that a student could use this program to work his way to the top of the class, mastering the stems and conjugations of the Hebrew verb like a virtual "morphology cruncher" (Winther-Nielsen 2011:296). The idea was therefore that if such results could be achieved when exercising paradigms from a Hebrew grammar, it should be possible to enhance learning even

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[4] See  Persuasive Biblical Hebrew e-Learning (Login as guest) for the  project site (http://bh.3bmoodle.dk/)
[5] See http://paradigmsmasterpro.com/.

more if this practice capability was anchored in the actual texts of the Hebrew Bible studied by the learners. Tøndering (2009) designed the architecture of an exercise tool 3ET, short for Ezer Emdros-based Exercise Tool, which generated exercises for students training their skills in reading, writing and parsing the words, phrases and clauses of the texts of the Hebrew Bible. This tool was released as a commercial Windows program in January 2010. However,  even though the idea of learning a language from a database seemed to be sound, the program did not sell well. The obvious conclusion was that the technology appeared to lack persuasive appeal.

The theory of Persuasive Technology suggested to the WP5 team that computers as persuaders would be able to change the way learners think and act, if designers created "computing applications that will deeply motivate people to acquire new knowledge and skills" (Fogg 2003, 246).  Our aim was to explore how training products would be able to adapt to motivational processes that match the needs of individual learners who are learning through cause-and-effect simulations and are rewarded for solving interactive problem sets and quizzes.

Fogg's theory is construed around a distinction of persuasive technology into a functional triad of tool, medium and social actor. Our first prototype of PLOTLearner was still only a tool for practice, little more than the 3ET it came from. Back in early 2011 it also still made sense to go for a Windows PC program, and through agile development this prototype was gradually developed into a simulation. The goal was to develop a learner-friendly and flexible environment that could easily be adapted to the individual needs of learners, implementing best practice in user-driven interaction design (Roger et al 2011).

**Figure 1A and 1B. Display and Exercise interface in PLOTLearner**
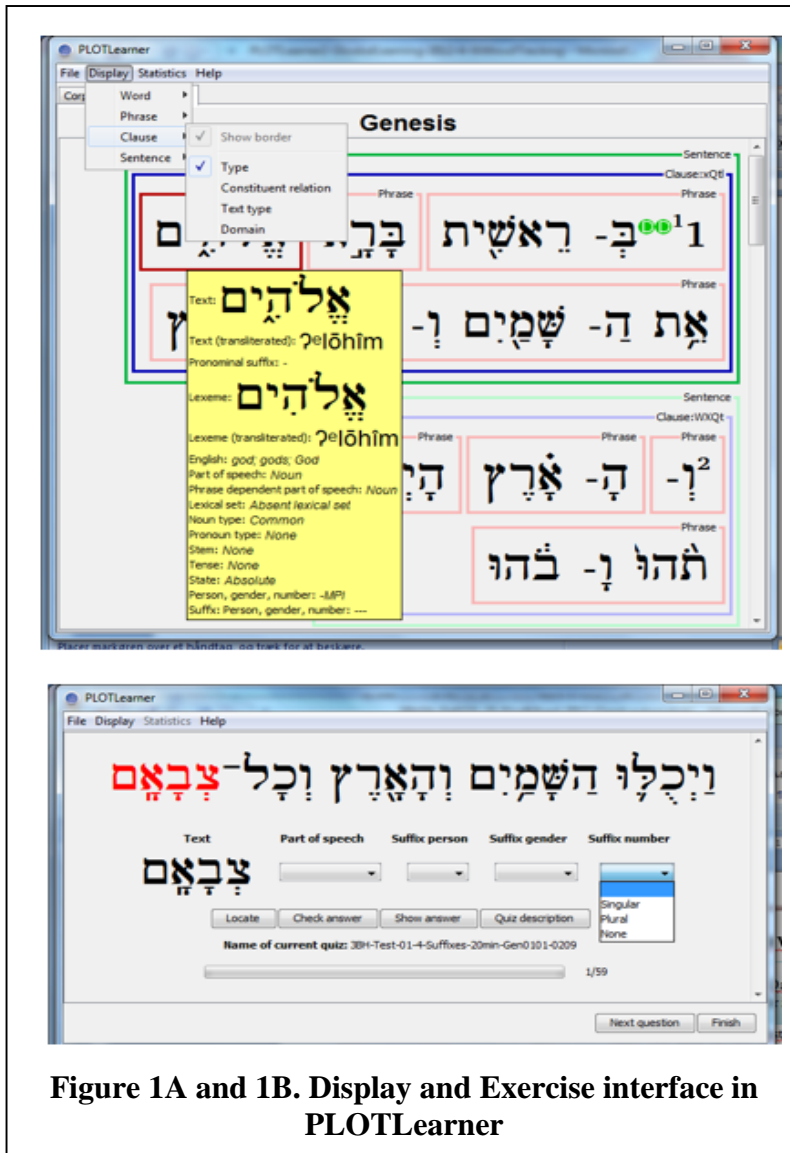
However, it is one thing to distinguish components in a learning system, but quite another to figure out how technology can drive optimal timing of learning for the learner. To this end, we explored the potential in the Greek philosophical idea of kairos, 'the appropriate timing', as a powerful concept for just-in-time and just-in-place learning (Behringer et al 2013b:4). The notion of khairos would provide us with "the ability to accurately estimate the appropriate time to initiate a persuasive principle" (Gram-Hansen 2011:9). To achieve the ideal persuasive khairos, we needed to plot all individual steps along the persuasion path and redefine the persuasive capacity for learning in, with and through technology.

We started out with a display and exercise technology shown in Figure 1A and B. From Fogg's (2003) theory of Persuasive Technology it is clear that the task in developing PLOTLearner was to focus on "design, research, and analysis of interactive computing products created for the purpose of changing people's attitudes or behaviors" (2003:5), though avoiding coercion (2003:15). The technology was developed as a corpus-application which was flexible and adaptable and could integrate with diverse learning scenarios. The textual corpus was treated as a supersized and limitless interactive learning object accessible through an interface, which empowered learners with the ability to learn the language and increased their motivation to do so. In this sense, the goal from the outset was to develop the technology for macropersuasion (2003:17), albeit integrating many small discrete learning objects to handle micropersuasion.

In order to define the intended persuasive effect of PLOTs, we first introduce the concept of persuasive force from Speech Act Theory. Searle and Vanderveken (1985) in their first chapter on "Illocutionary acts and illocutionary logic" defined how an utterance, in an appropriate context and used with certain intentions, can perform one or more illocutionary acts which have an illocutionary force F and a propositional content P. Similarly, for persuasive force we propose that the pedagogical content (pC) can fulfill an intended persuasive force (pF) under specific technological conditions. We assume that persuaders have clear intentions when they design learning content, aiming for persuasive force to effectuate learning when enacted in the right conditions. The crucial point is that in Speech Ach Theory illocution crucially differs from perlocution, which is the successful outcome of the act.

Likewise for persuasive technology we must pry out the successful persuasive outcome (pO), which is foremost at matter of different kinds of contextual responses achieved by the persuasive event. Facilitators can never control the response of learners for a resultant enablement and motivation, but they can and should design for persuasive "changes *intended* by the designers" (Fogg 2003: 17), focusing on the force designed for the technology (the pF).

This illocutionary perspective on design for learning helps us reconceptualize Fogg's proposal for persuasive principles encountered as functions of the tool. It enables us to rearrange the principles into a double track of increasingly enhanced persuasive force, reaching a peak at the ultimate moment of *khairos* (Winther-Nielsen forthcoming).

**Table 1. Redefining persuasive functions based on Fogg (2003)**

| | TOOL PRINCIPLE | PERSUASIVE FUNCTION |
|---|---|---|
| ABILITY | (1) Reduction | Users simplify intellectually demanding memorization or complex training |
| | (2) Tunneling | Teachers instruct learners in absorbing content or performing activity |
| | (3) Tailoring | Learners acquire knowledge or practice adapted to needs, interests, or contexts |
| MOTIVATION | (4) Suggestion | Learners inquire knowledge and do practice in optimal time, place or manner |
| | (5) Self-monitoring | Learners are encouraged by tracking of improved performance, outcomes or status |
| | (6) Surveillance | Teachers guide learners based on observed feedback on attitudes or behavior |
| | (7) Conditioning | Users expect rewards for transforming behavior into habits |

The system is envisioned as four orders of ability and motivation which merge in the ultimate fourth order peak of (4) Suggestion in Table 1. The simplest strategy for persuasion is the use of quiz technology for (1) Reduction to enable an improved training of forms. This is a basic first order force and it is parallel to the motivation achieved by (7) Conditioning through exams and the like, and it suffers from all the negative effects pointed out by Pink (2009) for Motivation 2.0: take away the stick and the carrot, and all motivational effect is not only lost, but there is a demotivational regression. The crude simplification and rewarding in a first order persuasive technology therefore does not take learners far into behavior and attitude change.

The second order enhancement of persuasive force is found when teachers use the tool to optimize the design of the learning and training course through (2) Tunneling, which enforces a predefined curriculum upon learners. They may achieve mastery by adhering strictly to the progress intended in the course material. Likewise a second order system will help teachers subscribing to mastery learning to plot the progress of learners through (6) Surveillance, enabling teachers to intervene whenever learners divert from the required progression along the predefined path. Motivation at this stage depends on the ability of learners to subscribe to an optimal learning outcome decided by expert instructors and guides. This type of persuasive technology relies heavily on extrinsic motivation.

The third order enhancement of persuasive force supports self-directed use of learning technology, because practice is now geared to (3) Tailoring to individual needs, interests, learning styles, progress, and educational culture. It will offer suggestions based on the prior progress of individual learners and statistical data on all learners using a similar system and give advice on possible ways to proceed. Through (5) Self-monitoring the learners are able to choose their own goals. Ideally the technology

will then gradually remove any tailored scaffolding and slowly turn the entire learning process into a self-directed engagement. A fourth order persuasive force of (4) Suggestion will only rely on the *khairos* of perfect timing, at the peak of the enhanced persuasive force for ability and motivation:

> As learners are autonomous creatures who want self-determination and strive for mastery, the maximally persuasive system will invite the ideal learner to choose at will from a pool with (4) suggestion, but it will also offer to gently guide the learner into knowledge and practice by stimulating activity and interest. (Winther-Nielsen forthcoming).

The four orders of persuasive forces enhancing the persuasive principles has formed the strategy for the project and remains the ideal goal for the development of the architecture of PLOTLearner as a persuasive technology. We implemented this system using the Laurillard's (2012) model of how to learn practice capabilities from an external environment, developed a so-called "plotted practice environment" (Winther-Nielsen 2013b; Gottschalk and Winther-Nielsen 2013).

## Flow: Persuasive Drive from Triggers

The parameters treated so far has plotted how the right time, place and manner is the ultimate goal of any persuasive technology, at the peak of its persuasive force, the *khairos* has also been treated as a blurred perspective and an ill-defined illusive concept. However, an analysis of the individual components can in detail plot how persuasive progression works, and in this way supersede the first generation models developed by Fogg and others which are sufficient as explanations for persuasion (Torning 2013). This section will propose a new viable second generation model for persuasive flow for learning, using triggers to improve the motivation of learners.

Fogg's Behaviour Model (FBM) is a more recent attempt to explain how a persuasive device at the appropriate moment can trigger the crossing of the "behavior activation threshold" (2009:3), and how it "tells people to perform a behavior now" (2003: 6). Triggers therefore explain the increasing likelihood that the persuadee performs a target behaviour and they come in three main varieties: (1) a spark motivates a person who is able to perform an action; (2) a facilitator enables a person who is motivated to perform an action; (3) a signal prompts a person to go ahead when he or she is both motivated and able to do so, and when the use of a spark or a facilitator would have had a detrimental condescending effect. However, learning processes are not necessarily as simple as the behavioural changes envisioned in the FBM. True to the tenets of behaviourism Fogg believes that reduction is the most promising trigger, because 'Simplicity is a function of a person's scarcest resource *at the moment a behavior is triggered'* (2009:6).[6] However, persuasive learning should not lead a learner into a dull demotivating simplicity, but should rather constantly increase the complexity in order to support an ongoing progression towards deeper learning and more advanced practice. In this sense there is a fundamental demand for an alternative to behaviourism. This should help us develop a different set of persuasive triggers that are prone to increase the motivation for more complex learning as well as set the learner onto a course towards intrinsic motivation, ultimately providing a much more realistic basis for self-directed learning.

The seminal work by Csikszentmihalyi (1991) opened a new perspective on how intrinsic motivation is driven by a mental state of flow. This effect is achieved when a person reaches a state of complete absorption into a task, characterized by intense concentration, losing self-awareness, and feeling perfectly challenged in a proper balance between boredom and anxiety (1991:4). This kind of flow is a

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[6] Fogg acknowledges this by recognizing the role of Skinner and Watson in learning theory See Fogg's references to Ripple and related theories at http://behaviormodel.org/references.html (Assessed May 28 2011).

matter of balancing motivational challenge with achievable ability, because people lose interest both when a boring task is not challenging enough or when the task requires excessive time or is frustrating because it is too hard to do. With improvement of skills over time, the challenge needs to develop along a trajectory that Csikszentmihalyi (1991:74) in his diagram called the flow channel.
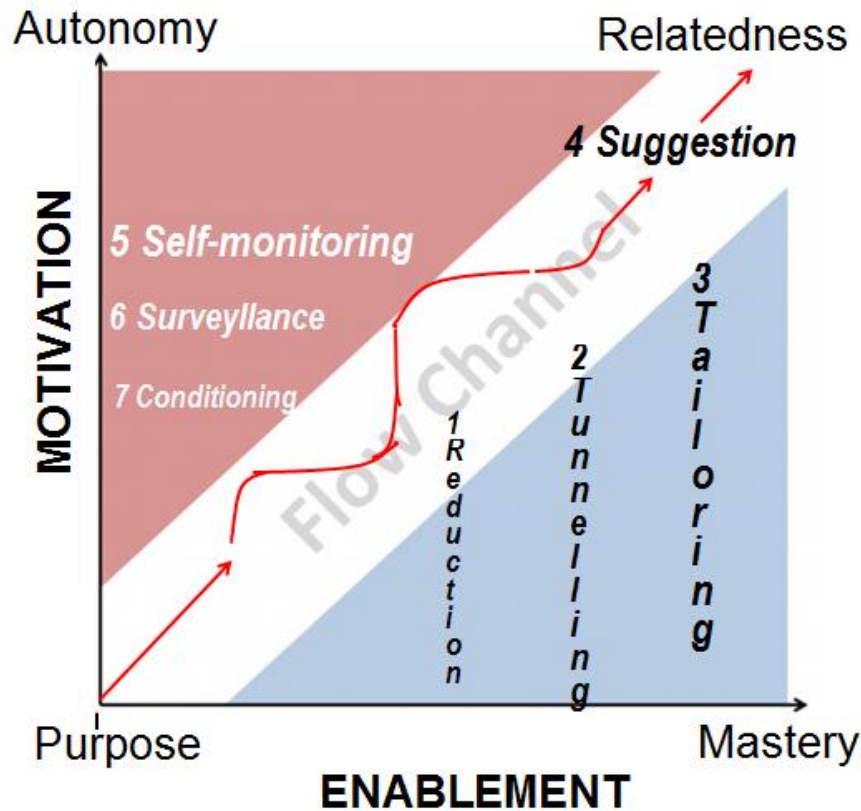


**Figure 2. The Persuasive Flow Channel**

If flow is to be applied to persuasive learning, the right amount of challenge must trigger the learner to move towards the edge of the learners' ability. The nature of the triggers of persuasive learning can be redefined from the research of Deci and Ryan (2000), who did empirical work on 100 cases that led them to formulate the Self Determination Theory, claiming that the three core motivators of autonomy, competency and relatedness drives intrinsic self-determination. Deci and Ryan focused on the crucial role of needs in different regulatory processes underlying goal pursuits that are associated with differing degrees of need satisfaction. This research seemed to indicate that the social contexts and individual differences that support satisfaction of the basic needs facilitate intrinsic motivation towards growth processes for autonomy, competence, and relatedness. Pink (2009) built on their work in his popular case for Motivation 3.0, but he replaced Deci and Ryan's relatedness motivator with a purpose motivator, postulating the three core motivators autonomy, mastery and purpose. Rather than choosing between either individual purpose or social relatedness, it seems preferable to include all four motivators in a robust theory of intrinsic persuasive learning. Recently Andrzej Marczewski (2013) has coined the acronym RAMP for his four parameter model with relatedness, autonomy, mastery and purpose.

Our own version of the RAMP model in Figure 2 provides us with the clue to persuasive technology. The model covers all persuasive triggers that can explain formal and informal learning in society, institutions and the workplace. Learners bring motivations and expectations, knowledge and skills that help them define their personal goals over against the curriculum requirements, credits, teacher motivation, course aims, and intended learning outcomes (Laurillard 2012:64). Learners have individual purposes and very personal inclinations prompting them to use a technology. The efficiency of the system depends on its ability to adapt to all learners and their cultures, even to those who are forced to use the technology or have to force themselves to do so, which is the crucial challenge for initial engagement. The RAMP-model also assumes that the ultimate goal of a technology is to be able to function in some social context of a class, group or online community, and ultimately help the learner to achieve a social position at work and in society. The learning technology must therefore be able to find the learners where they are and take them all the way to the social goals they desire, to use Kierkegaard's manifesto for our art of learning design – it gives us the triggers that can ramp-up persuasive learning!

The four motivators help us explain the flow generated by persuasive forces at work in a RAMP-model. Empirical data from EuroPLOT's survey of persuasive learning has pointed out that the weakest and most vulnerable part of a persuasive technology is how best to negotiate the commitment to learning (Herber 2013:62). Once a learner engages, the technology must work as a firing ramp that will empower learners to direct their own course of learning. It must help them understand the purposes invested into their learning environment and then suggest the optimal elements of motivation and enablement that at any given point will enhance their mastery as well as their autonomy. The impact from these two flow factors should help them plot their preferred course of learning by means of exposure to persuasive force and take them all the way to the ultimate stage of a persuaded learner is able to freely move around in the learning environment among a community of fellow learners.

Once engagement and commitment has worked successfully, learners and their facilitators can design the optimal persuasive flow through the PLOTLearner environment by gradually strengthening the autonomy and increasing the mastery towards full self-directed control and perfection. By means of firing the appropriate instructional content and offering the most qualified supervision, the technology can assist the learner to direct his personal persuasive drive for flow in the desirable direction. Typically, institutional requirements for awarding of degrees as well as professional requirements derived from the workplace will lead learners to define their own personal agenda. The technology should not go against the grain of specific and individual purposes for a learning process that can stimulate the engagement for learning, and thus functions as an initial valuable, albeit primitive (7) Conditioning. In order to satisfy the personal projects of the learners they will want to use exercises that through (1) Reduction will reduce some of the hard labour involved in practice, especially when learning a language. The second order persuasive force will fire when a teacher inspects the results of the learner practice through (6) Surveillance. PLOTLearner generates files with a complete tracking of the speed, accuracy and mistakes of the learner and learners can voluntarily choose to forward his or her achievement for inspection by the teacher in order to obtain feedback. The teacher can also set up a more controlled course environment and demand that learners forward these files on a regular basis in order to be able to control progress and provide essential feedback for mastery. In the latter case, the learner will be motivated to follow a particular sequence and layout of exercises and learning content in a (2) Tunnelling that the teacher has provided to enhance the skill training and progress in learning.

It is now possible to combine all dimensions in a unified description of a persuasive learning technology, replete with tool functions, four orders of persuasive force, facilitation afforded by motivation and ability parameters, triggers from the FBM, and last but not least, the flow bring the triggers together in the persuasive RAMP in Table 2.

**Table 2. Triggers for Flow in the persuasive RAMP model**

| | Triggers Fogg | Flow in RAMP | Learning Facilitation | Order of persuasive force | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | | | | 1st | 2nd | 3rd | 4th |
| **Ability & Motivation OK** | Signal | Purpose & Relatedness | Guidance | | | | Suggestion |
| **Increase Motivation** | Spark | Motivation | Feedback | Self-monitoring | > Surveillance | > Conditioning | |
| **Increase Ability** | Facilitator | Mastery | Skill practice | Reduction | > Tunnelling | > Tailoring | |

Even if PLOTLearner is not yet a fully developed third order persuasive technology, the developer team is working on this next generation technology to provide a complete overview of the learning progress for (5) Self-monitoring. Using these statistical data it already now suggests the most relevant exercises as a true (3) Tailoring to optimized practice, but this kind of tailoring can of course be developed much further. Our ultimate fourth order persuasive technology will support collaboration and hopefully even use elements from gamification that are tied into Suggestion (4).

**Table 3. The RAMP model according standard requirements for interaction design**

| RAMP | Design´Criteria | Definition in interaction design |
| --- | --- | --- |
| **Relatedness** | Connecting | Facilitating communication between people and communities. |
| **Autonomy** | Expressing | Encouraging self-expression and/or creativity. |
| **Mastery** | Empowering | Enabling people to go beyond their limits. |
| **Purpose.** | Engaging | Capturing attention, creating delight and delivering meaning. |

The RAMP model is the best illustration of the PLOTLearner-mechanics. Using this model as a central instrument, it will help us formulate a better strategy, design for the appropriate intended force and measure the effects. This will help us design better persuasive technology for the future and it can guide learners and facilitators who are repurposing the PLOT content to their own projects. For these reasons, we suggest that any persuasive technology must address all four triggers of the RAMP in order to serve as a launching pad that will fire the right kind of persuasive forces at the right stage. It will help learners and their facilitators to do better self-directed learning driven by the technology. It is furthermore significant that all four triggers cover essential design elements that are required in evaluation of design for user experience in interaction design, implying that our system should qualify as a fully operational learning design that satisfies standard criteria for an innovative interaction design as set out in Table 3.[7]

On the background of this overall analysis of the ideal framework for the design of a persuasive technology for language learning like PLOTLearner we remain much more optimistic about the effectiveness of Persuasive Technology than Gram-Hansen (2013). In Kierkegaard's terms, we believe that with the best Persuasive Technology, the persuasive flow will bring them to the place they are

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[7] These design criteria are taken from the Interaction design reward (http://awards.ixda.org/2013-interaction-awards/) which recognize and celebrate examples of excellence in Interaction Design across domains, channels, environments and cultures. Besides the four categories related to the RAMP model the design should also serve: 5 *Disrupting* which is the ability to "re-imagining an existing product or service by creating new behaviors, usages or markets" and 6: *Optimizing*: "Making daily activities more efficient."

persuaded to go. We are confident that the implementation of a corpus-driven learner-directed persuasive open system represents much more that a reflective meta-layer (Gram-Hansen 2013:73). The project has, because of limited funding, not realized all the plans defined in our design strategy, and the need for new features have evolved in responses from the evaluation work (for details, see Winther-Nielsen 2013a). However, the model is in our view a helpful guide for the further development and explanation of the mechanics of PLOTLearner and similar systems, living up to the best standards of design for interactive learning, even if our design should be improved during continued agile development.

## Context: Adapting to Where Learners Are

Even if a theory of persuasive RAMP technology is designed for effective motivation and enablement, this does not guarantee that the technology satisfies the other and even more important Kirkegaardian "secret in the entire art of helping" on the learner, which is first and foremost to "Find Him Where He is".
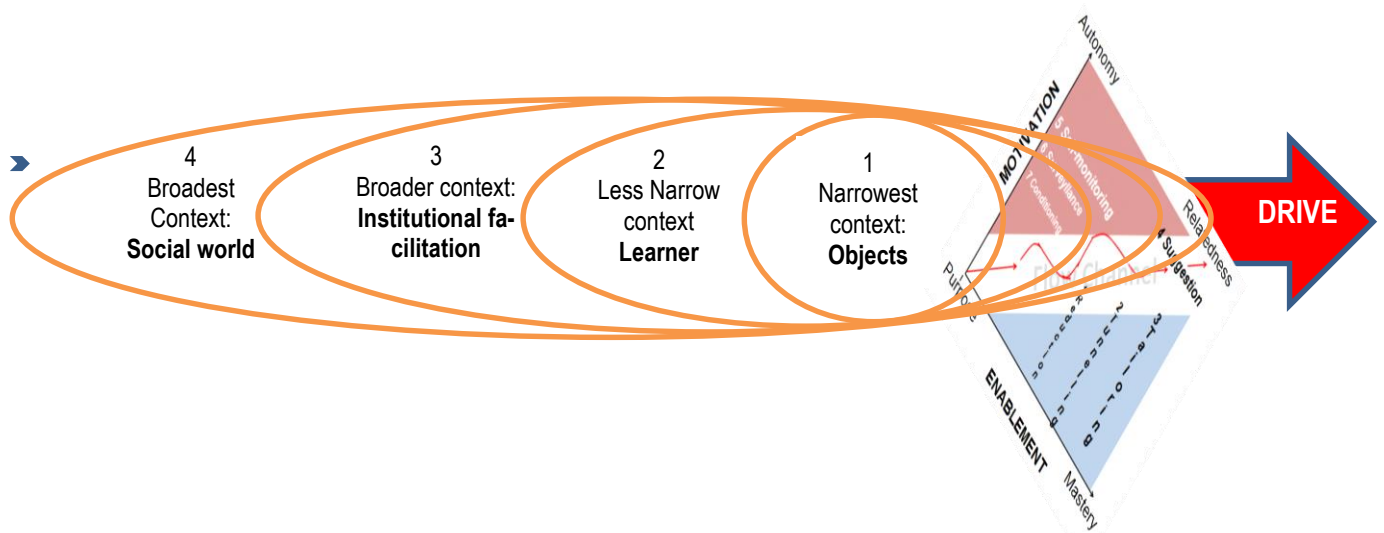


**Figure 3. The four senses of context for the persuasive RAMP**

The project started with the persuasive design of learning objects. Context$_1$ in the case of PLOTLearner is a text database and the data contained in this corpus that generates content to be learned. Texts and grammar items are displayed for enquiry and practice for skill acquisition. It has been observed time and again that feedback is crucial for practicing from an external environment (Laurillard 2012. Gottschalk and Winther-Nielsen 2013). WP5 has defined the architecture of the RAMP elements for persuasive motivation and enablement and implemented a considerable amount of these functions in the program. The project has redefined the core of learning as the database and learner-directed activity elicits corpus-driven feedback for enquiry and acquisition through an interface. The functions in this second narrowest type of context$_2$ are the learners, who were more in focus as persuadees than any other contextual element. The learner is influenced by a personal psychological endowment for learning as well as informal personal projects engaged in. This kind of learner-directed corpus-driven learning practice is well-described in publications (Winther-Nielsen forthcoming).
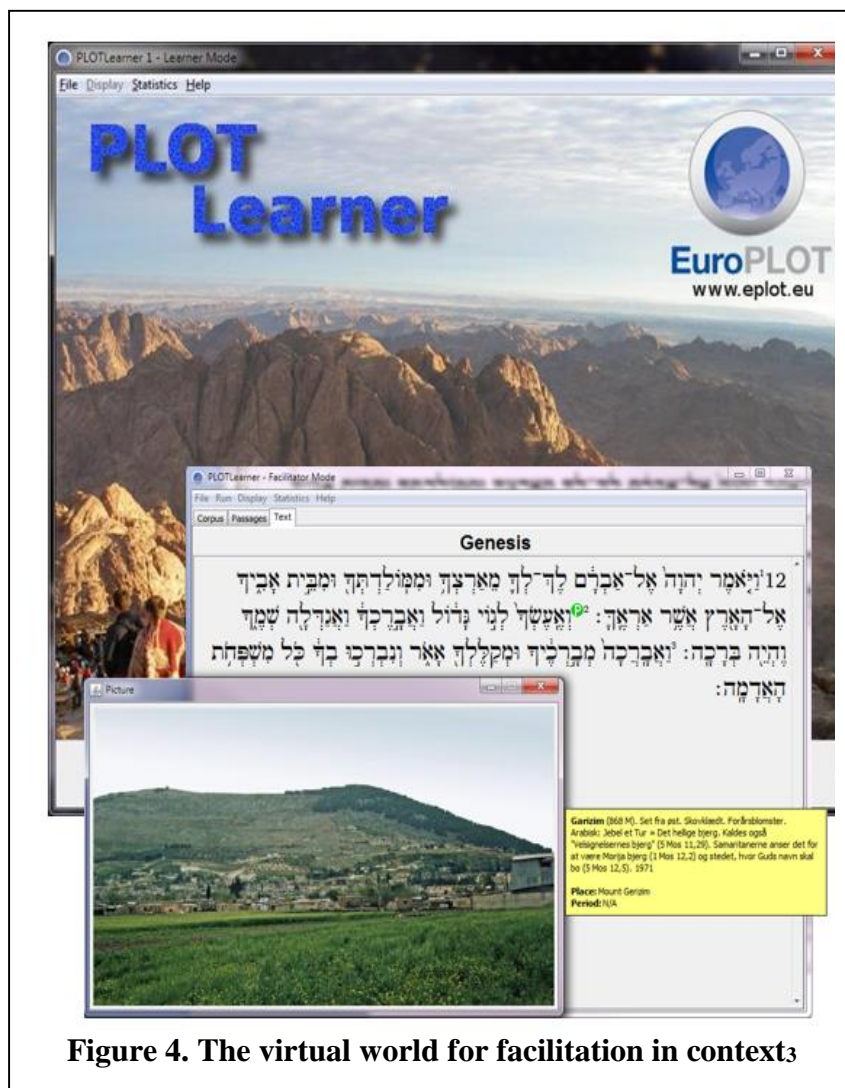
**Figure 4. The virtual world for facilitation in context₃**

Context₃, the educational environment, focuses on including the individual purpose for learning. PLOTLearner offers a facilitator mode that gives full control over construction or editing of exercises.[8] Teachers and advanced learners can freely edit the exercises that are downloaded with the program or create their own new exercises through the interface or writing of complex grammar queries for the database. The tool is unique in supporting this almost unlimited repurposing on any topic covered by one of the World's best databases for the Hebrew Bible. Teachers can improve on the description of learning content and give pedagogical hints at frequent mistakes as well as supply links to external content in reference grammars and videos. In this way, facilitators can specify their own desired goals for practice and aim at a specific persuasive motivation in order to enhance the engagement of learners and simplify for simpler practice routines. Descriptions can define learning outcome and give easy access to additional content for scaffolding. Facilitators also have access to statistics files that capture a "Complete local report" of all activity within a selected time slot.[9] PLOTLearner offers a learning journey with an "Exercise graph," which graphically plots the learner's progress into the mountains of Mount Sinai (Winther-Nielsen 2013b).

Another dimension of this facilitation context is the inclusion of instructional tasks. Over the last decade task-based language learning has proved successful, because authentic problems integrated into the learning environment offers the possibility for reflection on interesting problems and enhancement of personal identification with the strategy for learning. The tasks can range all the way from translation to interpretation or linguistic analysis and they can address problems in a real or an imagined world. In order to explore the persuasive effect of external context for scaffolding in PLOTLearner, we developed the picture and resource database EuroPLOT Resources.[10] The project built a sophisticated database system and volunteers stored a collection of close to 5000 photos from

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[8] See http://www.ezer.dk/3ETusersguide/PL-2.0.1/en/facilitator.php (Accessed December 11, 2014).

[9] See http://www.ezer.dk/3ETusersguide/PL-2.0.1/en/statistics.php (Accessed December 11, 2014)

[10] See http://resources.3bmoodle.dk/img.php (Accessed December 11, 2014)

landscapes and excavations in Israel. PLOTLearner scans this database, when the program opens a text from the Hebrew Bible and the text displays the symbol P for picture, V for video, and D for document, when there is some pertinent content available in the database or in a link. Our technology in this way automatically activates a virtual learning environment from the ancient historical context and offers this as scaffolding for the learner (Winther-Nielsen 2013b:27).

It has become quite clear that it is still a major challenge to sell new technology to teachers with years of successful classroom experience, when this new technology flips the classroom and focuses on a learner-directed acquisition and practice that fundamentally changes the teacher role into that of a facilitator. If persuasive learning is not integrated into a formal institutionalized learning, it will not attain any perlocutionary force.

The main challenge at present is, therefore, to develop a new education of Hebrew teachers. We will have to create course material and an online teacher-community in order to recruit and train facilitators who will understand the essential need of repeated, accurate and persuasive feedback during practice. In our experience, learners who have learned Hebrew through this new persuasive technology are the ones who are most likely to be able to design their own courses for PLOTLearner. A global community of teachers should exchange ideas on how best to use the technology and swap learning objects that are adapted to the technology and the new way of persuasion through technology. This teacher community can support pedagogical, technical and linguistic skill development for colleagues using the Hebrew database and discuss the learning potential of the linguistic information stored in text database. Our achievement will only truly stand out when we are able to engage many more teachers in collaboration on using, editing and creating new exercises, texts, videos, and other resources to be shared globally. Instructors will be then provide feedback on their own classes on introductory Biblical Hebrew and share learning objects and best teaching practice.

The fourth and widest sense of context focuses on online collaboration between learners in in Context4. There is currently no social collaboration across classrooms and among learners. Funding for the development of PLOTLearner in WP5 stopped already in August 2012, but the tool developed and disseminated by the EuroPLOT project has already been successfully tested and scaled up to an education for 500 students in Madagacar (Winther-Nielsen 2013), and it will be very useful for learners in African development countries with poor and expansive broadband connection.

Already in early 2013, but outside EuroPLOT and without funding, programmer Claus Tøndering started developing a second generation online version of PLOTLearner called Bible Online Learner with new and improved class registration feature.[11] At the same time Judith Gottschalk is implementing support for social learning in a new Learning Journey Online that supports plotting of learner progress. At present the system already implements the persuasive principles of surveillance (6) and self-monitoring (5) for skill development (Gottschalk and Winther-Nielsen 2013). Users of the Bible Online Learner can choose voluntarily to login on Bible Online Learner and this will automatically gather and upload all learner achievement data to the journey site. Using data-mining on the uploaded logged data, it tracks the learner's progress and gives feedback on the learning outcome so far. The technology-driven plotting of learner profiles can display skill values pertaining to automated practice in terms of number of right answers per minute (speed) and proficiency in terms of correct answers per minute (accuracy). The Learning Journey Online can even evaluate overall learner performance pertaining to a specific grammatical item (the likelihood of an ability), which is crucial to the experimental work of Metsämuuronen (2013). As soon as we can include the extent of text studied, we will have an indicator for the range and depth of the knowledge, and hence indicate a specific level of

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[11] See http://bibleol.3bmoodle.dk/ (Accessed December 11, 2014)

knowledge. In this way a system is being develop for learning metrics that can plot the automatization of the language learning process in terms the composite value of reaction time and error rate (DeKayser 2007:2).

The two-pronged solution with both the PC program called PLOTLearner and the online application will be developed further in projects initiated by the Global Learning Initiative.[12] The dissemination of PLOTLearner as a PC solution will continue in Madagascar, and meanwhile the online system Bible Online Learner is now being scaled up for testing by online students and in blended learning at the Fjellhaug Interenational University College Denmark, Malaysia Baptist Theological Seminary, and Andrews University in Berrien Springs in the US. We hope that the new Online Learner environment will eventually be used by hundreds or even thousands of users globally, who will provide feedback and logged data for statistical analysis.

Evaluation and development is currently focusing on developing better learning content and understanding the learner context through statistical data on $conext_{1-2}$ in order to be able to use these data for $context_4$, exploring the effects of gamification and comparing this with collaboration on tasks. We are currently experimenting with feedback on exercises and display of individual achievements in order to support a new kind of advanced online facilitation for teachers who can plot the progress of learners based on solid and constantly updated data and then can adjust facilitation to the needs of each individual learner. We expect to be able to improve on both the statistics and the visualization of this kind of data-mining and we will explore the efficiency of these big data on learner outcomes.

## Conclusion

To influence learners in their true setting and take them to a goal are the two basic aims that persuasive learning technology has in common with Kirkegaard and other educators. EuroPLOT has developed new ideas on contextual learning and new solutions for design of learning for reuse and repurposing in order to influence learners through persuasion. PLOTLearner as described in this paper shows how technology can accommodate to learners and offer a practice environment (Fogg 2003: 246).

WP5 has worked on a new model for persuasion through technology and gathered empirical data on the persuasive force of this technology for language learning. This papers has described how we developed the theory by reorganizing the traditional 7 functional principles into four orders of persuasive force and we then worked out how intrinsic motivation can be driven by the flow in a new model starting with purpose, combining persuasion through mastery and autonomy, and leading to relatedness in a new RAMP model.

That this model for persuasive technology works has been argued from the deployment and evaluation of PLOTLeaner as a free, open, and adaptable application for Windows computers. The achievement of the project does not end with EuroPLOT, however. While PLOTLearner will continue as a client-based solution for the Majority World, this new way of learning is now being ported into the cloud as Bible Online Learner. The new online version will offer new open educational resources for global education, and the technology will gather rich statistical data for mining of effectiveness of persuasive technology for learners and their facilitators.

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[12] See http://global-learning.org/ (Accessed December 11,2014)

## Acknowledgements

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