Chapter 11

Student learning: A framework for designing study programs to stimulate deep learning.

Hester Glasbeek. LEARN! Academy, Vrije Universiteit, Amsterdam, Netherlands

About Learn! Academy

The mission of Learn! Academy is to strengthen the teaching and learning culture in higher education, by empowering faculty and supporting them to put research-informed principles about learning and teaching into practice. Chapter 31 by Brouwer & in ‘t Veld explains (among other things) how we empower and support faculty. For information about our funding sources and reporting structure I also refer to chapter 31. The focus in this chapter is the theoretical foundation of our mission; the principles for course and program design; and theories and priciples we advocate with our faculties.

Designing meaningful and effective study programs

Learn! Academy aims to stimulate and support faculty to design meaningful and effective study programs. By that we mean programs that contribute optimally to students´ talent development and reduce unnecessary drop out or study delay. Meaningful and effective programs help students to become experts in their field, by stimulating their interest and motivation and by encouraging them to construct rich, adequate knowledge representations and to acquire relevant academic and metacognitive skills (Glasbeek, 2015).

Theoretical foundation: Constructivist view on learning, Constructive Alignment, Taxonomy for Significant Learning, Self Determination Theory

Constructivism

Our design approach is based on a constructivist view of learning. Thinking about this view and its implications is eye-opening for many of our participants, since it contrasts with most novices’ conception of teaching, coming down to ‘teaching means telling what you know’. Common misunderstandings we meet about constructivism are that it´s synonymous with using interactive teaching methods or with complete freedom for students to set their own goals. In order to solve these misunderstandings, it helps to clarify our position within the

debate about constructivism and to contrast constructivism to more objectivist views of learning.

Constructivism is a popular and broad movement. Researchers and educational designers with a variety of ideas consider themselves constructivist. What they share is the assumption that learning is not a passive, knowledge-absorbing and externally driven process, but an active, constructive and self-directed process in which learners build up internal knowledge representations that form a personal interpretation of their learning experiences (Bednar, Cunningham, Duffy & Perry, 1992).

In our programs we contrast constructivism against more objectivist views like the system approach (Merrill, 1983; Reigeluth & Stein, 1983), pointing out the following differences.

- In a constructive approach the student's perspective is central, whereas the objectivist tradition focuses more on the content and structure of instruction and the actions of the instructor.
- Constructivism attaches more importance to metacognitive skills and the ways knowledge is developed, whereas objectivist approaches put more emphasis on the body of knowledge that students must acquire. The aim of constructivist education is not so much that students know things, but that they are capable of exploring ideas themselves and developing plausible interpretations from different perspectives (Cunningham, 1992).
- Constructivist approaches put more emphasis on activating (often interactive) teaching methods. Some of our participants consider lecturing or having students read texts as 'passive teaching methods'. However, this does not follow from the constructivist view of learning. We tell our participants that every method can support active construction of knowledge. While reading or listening, students can be actively connecting new information with existing knowledge, with more intensity and a greater learning effect than while answering questions, or following assignments all the time. What matters is that teachers keep wondering where students are and what experiences and activities they need in order to learn; instead of determining what students need to know and what information or instruction should be presented in which order.

Differences *within* constructivism relate to the question to what extent meaningful knowledge construction is determined by the individual. Roughly two schools can be distinguished, a radical and a more moderate one (Karagiorgi & Symeou, 2005). Radical constructivists believe that knowledge is unique for every individual and that every interpretation may be a good learning result, as long as that interpretation is meaningful and viable for the individual. The term 'viable' is used as an alternative to (the objectivist concept of) ´true´ or ´correct´. Moderate constructivists believe that interpretations must also be socially viable. Construction of meaning takes place within the groups we belong to (Von Glasersfeld, 2001; Willis, 1998). An interpretation that is only meaningful to ourselves is inadequate; reality and the social context impose limitations on what meaningful interpretations and claims are.

Besides, radical constructivism assumes that learners develop optimally if they are completely free to follow their own interests and to set their own goals. The role of the teacher in this view is that of a coach or process supervisor. Our design approach fits within a more moderate form of constructivism. It assigns a greater role to didactically skilled experts, who can familiarize students with the codes and culture of the discipline and who can bring students in touch with goals, issues and solutions they do not necessarily discover spontaneously.

Constructive alignment

With his concept of *constructive alignment* Biggs connects the constructivist view on learning to the concept of *alignment*, that derives from instruction theory (Biggs, 1996; Biggs & Tang, 2011). *Alignment* means that the various parts of a design are interrelated. In an aligned course (or curriculum) the goals, assessment forms and teaching methods all are in agreement. *Constructive* alignment implies that a course or curriculum is designed around students' learning goals and activities, rather than around content and knowledge. This does not mean that content and knowledge are unimportant, defining learning goals includes describing knowledge domains.

The implications of this concept can best be explained by describing an example of an 'unaligned' course. Suppose a teacher wants students to be able to draw connections between various theories, to think critically and to analyse phenomena from different perspectives (learning goals). This teacher offers seminars and assignments that serve these goals. Students are invited to unravel texts, to come up with counter-examples for claims, to

apply concepts on real life cases and to advocate various positions (learning and teaching activities). However, for practical reasons (time and money) the assessment is a multiple-choice exam in which facts, definitions and unambiguous cases are questioned.

It is not difficult to predict which problems will arise in this course. If students know beforehand that the assessment is a multiple-choice exam and rote learning is the best strategy to pass, most students will opt for this. They will not be motivated for the class assignments and debates the teacher has in store for them. They will pass the exam; many of them still not able to see connections or think critically about the course subjects. The few students who are enthusiastic about the lessons and actively participate in class debates will be disappointed with the exam, because it doesn't give them the opportunity to show what they have learned. Some from this group may fail, even though they have achieved the learning goals, because the examination asks for details and they have focused on large lines and connections.

Constructive alignment appears to be a simple but powerful concept in designing and evaluating courses and curricula. Some of our participants think it is an open door at first glance, to gradually discover that their problems, like a lack of student motivation or low achievements, often can be explained from 'unalignment' at some level of their design.

Taxonomy of significant learning

A crucial step in educational design is constructing well defined learning goals. The educational literature offers various taxonomies to support this step. Although there is criticism on their theoretical basis (see for instance Paul, 1985), these taxonomies appear to be helpful for teachers and designers. They meet the shared intuition that there are different kinds of knowledge. To be able to reproduce a fact, term or formula is different from being able to explain a fact, to recognize a phenomenon in a new situation, to apply a formula properly at the right time. When novice teachers think about the question what students need to learn, they tend to think about areas and subjects ('they must know about cell structure, cell processes and photosynthesis'). Working with a taxonomy helps them to define how students should be able to use their knowledge about these subjects ('to describe and apply different cell processes at different organizational levels and to explain in their own words which factors influence these processes').

Commonly used are the taxonomies of Bloom (Bloom & Krathwohl, 1956; Anderson & Krathwohl, 2001), Biggs (Biggs & Collis, 1982) and Miller (1990). In our programmes we use Fink's taxonomy of significant learning (Fink, 2013). Fink's taxonomy distinghuises six categories of learning goals: *foundational knowledge, application, integration, human dimension, caring* and *learning to learn*.

We have several reasons for this choice. First, Fink encourages a broader view on academic learning, by distinguishing categories like 'caring', in addition to more traditional learning goals like 'applying' and 'analysing'. This fits with the importance our university attaches to societal impact and with its ambition to educate students to become responsible, critical and committed academics, who want to keep developing themselves (Vrije Universiteit, 2018). Second, Fink does not consider the acquisition of different types of knowledge as separate or successive processes, but as dynamic and interactive. Third, Fink's taxonomy is well compatible with the Dublin descriptors, which describe the requirements all programmes in European higher education must meet. This makes Fink an attractive model for determining and describing learning objectives at various levels.

A disadvantage of Fink´s work according to our participants is that his categories are not too clearly distinguished and defined, which makes the taxonomy hard to apply. Two remedies prove useful to overcome this problem. Fink defines 'backward design' as a core principle in educational design: start with the end in mind. One of the first steps attached to this principle is to finish this sentence: "*A year (or more) after this course is over, I want and hope that students will…..*" This thought exercise stimulates teachers to look beyond learning goals like knowing and understanding. Also helpful to our participants are Fink's precise and meaningful examples of learning goals, like: a year after this course is over I want and hope students will:

- remember the terms associated with microbial anatomy, biochemistry, and disease (*foundational knowledge*);
- be able to do a formal analysis of pictures when they visit an exhibition in an art museum in terms of the main elements of design (*application*);
- integrate ideas about energy from chemistry and microbiology (*integration*);

- become more confident about their ability to learn this material and be less intimidated by it (*human dimension*);
- value the importance of precise language in this field of work, as part of professionalism (*caring*);
- be able to identify important resources for their own subsequent learning (l*earning how to learn*).

(Fink, 2003-p.76-78).

Student Motivation: Self Determination Theory

Student motivation is a key issue for participants in our programs. Often participants express their disappointment about the little interest students show in their subject and the high interest in passing exams. Many teachers believe university students should demonstrate intrinsic motivation for their study.

Our design approach does not consider interest and motivation as entry requirements but as learning goals. Both intrinsic and extrinsic motivation are important for academic achievement and extrinsic motivation can develop towards more intrinsic forms of motivation. A good degree program encourages and supports this development. We find support for this position as well as starting points for design principles in Deci & Ryan's Self Determination Theory (SDT).

The SDT acknowledges the power of intrinsic motivation as a natural wellspring of learning and achievement, resulting in high-quality learning and creativity. Besides the theory states that intrinsic motivation can be systematically catalysed or undermined by ones environment. (Ryan & Stiller, 1991).

Deci & Ryan (1985) describe two of the psychological needs that must be fulfilled for intrinsic motivation: the need for *competence* and the need for *autonomy*. People want to feel they are up to the tasks they are getting; that they are good at something. If tasks are always too difficult, their need to feel *competent* is unfulfilled and there will be no room for intrinsic motivation. If tasks are too easy, they get no chance to experience or show their competence and the intrinsic motivation they might have had will extinguish.

In addition, a sense of *autonomy* is required for intrinsic motivation. Students must feel they themselves cause their sense of competence. Deci & Ryan call this the need of an "internal perceived locus of causality". A tight structure with many small sub-tasks and little

freedom to make one's own choices can contribute to the feeling of being competent, but it still impedes intrinsic motivation, because the need for a feeling of autonomy is not fulfilled.

Competence and autonomy are necessary but not sufficient conditions for intrinsic motivation. People do not find every task interesting in itself, even if they feel perfectly capable of carrying out the task and are allowed to make their own choices while performing. For most students their degree program includes subjects they do not find spontaneously interesting. For those subjects they need a form of extrinsic motivation to persevere and accomplish their goals.

According to Ryan & Deci (2000) the distinction between intrinsic versus extrinsic motivation is generally presented too dichotomously. They suggest a continuum in which different degrees of motivation are distinguished, with intrinsic motivation as the highest form (Ryan & Deci, 2000-p.61).

In the most autonomous form of external motivation, *integration*, students have integrated the value of a (not chosen) task into their own values and norms. Just as with intrinsic motivation, these students experience their acting as their own choice. The main difference is that student do not just act for the pleasure of reading and studying, but because of a value outside of that activity (for example, getting well into your profession and being able to contribute to society). The quality of the learning outcomes of studying that is regulated by *integration* can be assumed comparable to intrinsically motivated studying, whereas more externally regulated studying relates to more superficial learning and lower study effort (Kusurkar et al., 2013). Study programs and teachers can support students to reach the higher forms of external motivation. Therefore again the human needs for autonomy and competence must be met sufficiently. In relation to extrinsic motivation Ryan & Deci mention a third basic human need: the need for a sense of *relatedness*. To integrate the values the study program stands for, it helps when students feel that they are seen and appreciated by their teachers and fellow students, that they belong to the study community.

The SDT appears to be inspiring for our participants. Teachers appreciate the positive view on education related to SDT; its aiming at helping individuals develop into competent and independent professionals and members of society. In addition, Ryan and Deci's work expresses a sense of reality. The power of intrinsic motivation is recognized, but they don't claim that students will do great as long as they can follow their own heart. By

identifying the need of autonomy, competence and relatedness as basic needs that must be fulfilled to enable ´higher´ forms of motivation, resulting in better learning, the SDT also offers starting points for design principles. These will be described in the recommendations section.

Empirical foundation

In our programmes on educational design teachers think about the three components of Biggs ´ constructive alignment model: *learning goals & intended outcomes*, *assessment forms & feedback* and *learning & teaching activities*, both separately and in conjunction, after an analysis of *relevant contextual factors*. Participants are encouraged to adopt a research informed approach in doing so and take into account empirical evidence. Among the publications they are referred to are Schneider & Preckel (2017); Hattie (2013); Hattie & Timperley , 2007); Kuh et al. (2011); Bain (2011); Nilson (2018) and Panadero & Jonnson (2013). This paragraph briefly summarizes relevant evidence for each component of the design process.

Analysis of the context

The most important variables to take into account in this step of the design process, are student and teacher variables. These are more decisive than, for instance, characteristics of the institution or technology (Schneider & Preckel, 2017; Hattie, 2009).

In general, *students´* starting level is the most important predictor for academic achievement. Other relevant student variables are motivation (Feltzer & Rickly, 2009; Kurzurkar et al, 2013), metacognitive skills (Wang , Haertel & Walberg, 1990) and study strategies (Cotton , 2000; Vermunt, 2005). Study programs can take measures to improve the starting position of upcoming students, for instance:

- Help students choose an appropriate degree program, by giving good, realistic study information and organizing an informative introduction that promotes curiosity and involvement;
- Know the students' qualities, interests and knowledge gaps, for instance by using a formative entrance assessment;
- Promote academic and social integration from the first day;

- ∞ Explain and illustrate from the first day what you expect of students in terms of study behavior and effort, give them feedback on these, and let them reflect on differences with their previous education;
- ∞ Offer targeted remedial education, on a voluntary basis, for students who are underprepared for instance in math, (academic) reading or writing;
- ∞ Be sensitive to diversity and ensure that every student can feel at home.

According to Hattie (2009) the quality of *teachers* is the most important influence on student performance over which schools have some control. This finding is in line with Schneider & Preckels' meta-analysis on achievement in higher education. Good teachers invest time and effort in designing well-structured courses, establish clear learning goals and employ effective feedback practices. They stimulate meaningful learning by using interaction, clear explanations and demanding learning tasks (Schneider & Preckel, 2017). These findings emphasize the importance of well-thought-out strategies for teacher professionalization. As Chapter 31 by Brouwer & In 't Veld documents, Learn! Academy targets at programs for university teachers at various levels, in which formal and informal forms of learning are blended and development of teaching qualities is connected to leadership development.

Learning goals and intended outcomes

Clear, meaningful and challenging learning goals are associated to students' achievement (Schneider & Preckel, 2017). From Fink´s work and the SDT the advice can be deduced to combine various types of learning goals in each module. The traditional idea that first year students need to acquire basic concepts and must not be confronted with more complex problems can be discouraging and demotivating. More empirical evidence for this recommendation comes from Billing (2007) and from Renkl, Mandl & Gruber, 1996).

Billing concludes from research into acquisition of academic skills that there is little transfer of these skills when they are offered separately from domain-specific knowledge. Conversely, isolated provision of domain-specific content leads to inert knowledge which is not activated in situations where this knowledge is needed (Renkl, Mandl & Gruber, 1996).

Assessment and feedback

Students' study behaviour is strongly influenced by their expectations about the assessment (f.i. Sambell & McDowell, 1998). This result fits in the concept of constructive alignment: if deep processing is intended, deep processing must be assessed.

Regular and good feedback strongly contributes to more effective studying and better achievement (Gibbs & Simpson, 2004; Hattie, 2009; Hattie & Timperley 2007). According to Hattie & Timperley good feedback enables students to answer three questions: where am I going to, how am I going and what is my next step? Rubrics can be a useful feedback tool. Well-constructed rubrics can help students to understand the meaning of criteria, reflect on their own work and stimulate development of metacognitive skills (Panadero & Jonsson, 2013). A prerequisite for success is that the use of a rubric is integrated into the learning process. Simply handing out the rubric to the students at the beginning or the end of the course does not work.

Teaching and learning activities

There is much evidence that students learn more from teaching methods that explicitly invite them to think and talk about study material than from lectures where they mainly or exclusively listen (Schneider & Preckel, 2017). However how activating teaching methods must be is related to students' level of self-regulation. For students who are highly self-regulating, too much activation can actually be unproductive (Vermunt & Verloop, 1999). And since most degree programs aim to educate autonomous 'learners for life', it is recommended to reduce external regulation and activation over the course of the curriculum and to make clear to students that gradually more initiative and independence is expected from them (Glasbeek & Visser, 2018).

A point of attention is the relationship between contact hours and self-study. Van der Drift & Vos (1987) found that the optimal amount of contact hours is between 300 and 400 hours per year. Gijselaers & Schmidt (1995) mention an optimal number of twelve contact hours per week. With less contact time students become less involved and give priority to other activities; with more contact time students don´t get enough room for self-study. An optimal relationship is not only determined by quantity, but also by quality. Students must experience alignment between self-study assignments and contact hours. They must notice that the outcome of self-study assignments returns in the lectures; and contact time must be used to structure self-study time as well as possible (Schmidt, et al., 2010). Fink's idea of a castle top sheet (Fink, 2013) turns out to be useful for achieving this alignment.

Conclusion and recommendations

One of the conclusions teachers may draw from our teaching qualification programs is that course and program design is complex. Educational designers have to take into account a large number of factors and interests, some of which reinforce each other and others are in conflict. Programs must provide both sufficient space for autonomy and sufficient structure and support to become competent. The optimum differs per individual. Students (like other people) want to learn and develop; most students want to get the best out of their studies. But also from the rest of their lives; studying competes with many other goals and activities. That is why students, although they genuinely want to get the best out of their studies, regularly decide to take their exams with minimal effort.

Most teachers want to offer students the best possible programs. But teachers also are human beings with many goals and worries. Apart from teaching, they often have administrative and research tasks, the latter of are valued higher.

Three recommendations are crucial for these kinds of dilemmas. They do not offer a success guarantee, but they do form the conditions for success:

1. Keep balancing. Designing meaningful and effective study programs is a complex task and requires the art of balancing. Many factors and interests, interacting in many ways, must be taken into account.
2. Keep in touch. Teachers, students, alumni, education managers and managers; keep searching for dialogue; go on asking and telling each other what you do and why you do it.
3. Keep searching for feedback (Hattie, 2009). Assume students´ progress or lack of progress as feedback on the quality of the curriculum, rather than as an evaluation of students' talents.

References

Anderson, L. W., & Krathwohl, D. R. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives.* (L. W. Anderson & D. R. Krathwohl Eds.). New York: Longman.

Bain, K. (2011). *What the best college teachers do*: Harvard University Press.

Bednar, A. K., Cunningham, D., Duffy, T. M., & Perry, J. D. (1992). Theory into practice: How do we link. *Constructivism and the technology of instruction: A conversation*, 17-34.

Biggs, J. (1996). Enhancing teaching through constructive alignment. *Higher Education, 32*(3), 347-364.

Biggs, J. B. (2011). *Teaching for quality learning at university: What the student does*: McGraw-Hill Education (UK).

Biggs, J. B., & Collis, K. F. (1982). *Evaluation the quality of learning: the SOLO taxonomy (structure of the observed learning outcome)*: Academic Press.

Billing, D. (2007). Teaching for transfer of core/key skills in higher education: Cognitive skills. *Higher Education, 53*(4), 483-516.

Bloom, B. S., & Krathwohl, D. R. (1956). Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain.

Cotton, K. (2000). The Schooling Practices That Matter Most.

Cunningham, D. J. (1992). Beyond educational psychology: Steps toward an educational semiotic. *Educational psychology review, 4*(2), 165-194.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*: Springer Science & Business Media.

Feltzer, M., & Rickli, S. (2009). De invloed van persoonlijkheidskenmerken en andere factoren op studie-uitval in het hoger onderwijs. *Klinische Kinder-en jeugdpsychologie afdeling Psychologie en Gezondheid, Universiteit van Tilburg*.

Fink, L. D. (2013). *Creating significant learning experiences: An integrated approach to designing college courses*. San Francisco: Jossey-Bass.

Gibbs, G., & Simpson, C. (2004). Conditions under which assessment supports students' learning. *Learning and teaching in higher education, 1*(1), 3-31.

Gijselaers, W. H., & Schmidt, H. G. (1995). Effects of quantity of instruction on time spent on learning and achievement. *Educational Research and Evaluation, 1*(2), 183-201.

Glasbeek, H. A. (2015). *Wat werkt in hoger onderwijs? Aanbevelingen voor het ontwikkelen van een leerzaam en studeerbaar curriculum*. Learn! Academy. Vrije Universiteit. Amsterdam.

Hattie, J. (2013). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*: Routledge.

Hattie, J., & Timperley, H. (2007). The Power of Feedback. *Review of Educational Research, 77*(1), 81-112. doi:10.3102/003465430298487

Jonsson, A., & Svingby, G. (2007). The use of scoring rubrics: Reliability, validity and educational consequences. *Educational research review, 2*(2), 130-144.

Karagiorgi, Y., & Symeou, L. (2005). Translating Constructivism into Instructional Design: Potential and Limitations. *Educational Technology & Society, 8*(1), 17-27

Kuh, G. D., Kinzie, J., Schuh, J. H., & Whitt, E. J. (2011). *Student success in college: Creating conditions that matter*: John Wiley & Sons.

Kusurkar, R. A., Ten Cate, T. J., Vos, C. M. P., Westers, P., & Croiset, G. (2013). How motivation affects academic performance: a structural equation modelling analysis. *Advances in Health Sciences Education, 18*(1), 57-69. doi:10.1007/s10459-012-9354-3

Merrill, D. (1983). Component Display Theory. In C. M. Reigeluth (Ed.), *Instructional Design Theories and Models: An Overview of their Current States*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Miller, G. E. (1990). The assessment of clinical skills/competence/performance. *Academic medicine, 65*(9), S63-67.

Nilson, L. B. (2016). *Teaching at its best: A research-based resource for college instructors*: John Wiley & Sons.

Panadero, E., & Jonsson, A. (2013). The use of scoring rubrics for formative assessment purposes revisited: A review. *Educational research review, 9*, 129-144.

Paul, R. W. (1985). Bloom's Taxonomy and Critical Thinking Instruction. *Educational Leadership, 42*(8), 36-39.

Reigeluth, C. M., & Stein, R. (1983). Elaboration theory. In *Instructional-design theories and models: An overview of their current status*. Hillsdale NJ: Lawrence Erlbaum Associates.

Renkl, A., Mandl, H., & Gruber, H. (1996). Inert knowledge: Analyses and remedies. *Educational Psychologist, 31*(2), 115-121.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology, 25*(1), 54-67. doi:http://dx.doi.org/10.1006/ceps.1999.1020

Ryan, R. M., & Stiller, J. (1991). The social contexts of internalization: Parent and teacher influences on autonomy, motivation and learning. *Advances in motivation and achievement, 7*, 115-149.

Sambell, K., & McDowell, L. (1998). The construction of the hidden curriculum: messages and meanings in the assessment of student learning. *Assessment & Evaluation in Higher Education, 23*(4), 391-402.

Schmidt, H. G., Cohen-Schotanus, J., van der Molen, H. T., Splinter, T. A., Bulte, J., Holdrinet, R., & van Rossum, H. J. (2010). Learning more by being taught less: a “time-for-self-study” theory explaining curricular effects on graduation rate and study duration. *Higher Education, 60*(3), 287-300.

Schneider, M., & Preckel, F. (2017). Variables associated with achievement in higher education: A systematic review of meta-analyses.

van der Drift, K. D., & Vos, P. (1987). *Anatomie van een leeromgering: een onderwijseconomische analyse van universitair onderwijs*: Swets & Zeitlinger.

Vermunt, J., & Verloop, N. (1999). Learning and instruction. *Congruence and Friction between Leaving and Teaching, 9*(3), 257-280.

von Glasersfeld, E. (2001). The Radical Constructivist View of Science. *Foundations of Science, 6*(1-3), 31-43. doi:10.1023/A:1011345023932

Wang, M. C., Haertel, G. D., & Walberg, H. J. (1990). What influences learning? A content analysis of review literature. *The Journal of Educational Research, 84*(1), 30-43.

Willis, J. (1998). Alternative Instructional Design Paradigms: What's Worth Discussing and What Isn't. *Educational Technology & Society, 38*(3), 5-16.