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A CONVERSATION ON INSTRUCTIONAL DESIGN WITH ROBERT GAGNÉ AND DAVID MERRILL NO:3

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Abstract:
The purpose of the study is to bring in the third part of diachronic conversation on instructional design with Robert Gagné and David Merrill to trancripts. This conversation was hosted by Utah State University, in the United States of America, in July 10, 1989. Throughout the history of instructional design, these two scientists are considered as the pioneers of the field and in these sessions, they summarize and compare their studies. In the third session, Gagné and Merrill represent their theories from their own perspectives.

Keywords: Gagné, Merrill, conversation, instructional design

1. Instruction

Robert Gagné was the most important name in the field of instructional design area. He followed by many researchers and scientists. Like David Merrill ve Charles Reigeluth. Merrill's Component Display Theory, Reigeluth's Elaboration Theory have some marks from Gagné s work.

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2. Method

Conversation videos are not commercial. Utah State University made open acccess to find them at https://archive.org/details/ConvInstDesign. So those videos are dowloaded. Transcripts are created.

3. Findings

Don Smellie: I am Don Smellie, professor of education and head to the Instructional Technology department at Utah State University. Recently we hosted a conversation on instructional design with Doctor Robert Gagne from Florida State University and Doctor M. David Merrill at Utah State University. Now, neither of these individuals needs an introduction. Doctor Gagne is among the most prominent names in our field and considered by many as the father of instructional design as we know it today. Objectives, hierarchies, and the conditions of learning form the theoretical foundation upon which many have built in designing and developing instructional products. Doctor Merrill has based much of his efforts on Doctor Gagne's work. He has elaborated areas which he felt needed more detail. Component display theory and elaboration theory are recognized as major contributions to the field of instructional technology. Together Doctor Gagne and Doctor Merrill represent fundamental theoretical focal points upon which much of what we know about instructional design is based. These two prominent theorists have cooperated and shared their views before but never before in such a lasting and personal way as you are about to see. This is a video transcription with minimal editing. It is not a commercial studio production but a working transcription of the live proceedings. You should have also received a graphics package which contains the visuals used with other supporting materials that were distributed during the conference. As you will see the agenda acted as a guide rather than a blueprint. Now don't be alarmed that many of the graphics and agenda items are not mentioned are used during the discussion. We are richly rewarded by the content that they choose to address. In session three doctors Gagne and Merrill deal in some detail with the cognitive psychological bases of instructional design. You will find that they address aspects of the categories of the learning and find some common ground in discussing procedural and declarative knowledge, and its relationship to Merrill's content structures. Let's join this third session now.

Gagné: I want first to talk about what seemed to me to be some important ideas or concepts from cognitive psychology that it seems to me have definite implications for instructional design. So let me start that way. The first idea is the notion of information processing or the really the idea that information processing occurs in a number of stages or phases in the process of learning event. And some of these I'll mention as I go along, but the fact that there are these phases maybe I think is important because it seems to me it shows that one cannot think of a learning event as being a kind of a simple thing that occurs in the manner let's say that we used to use to describe a condition response. There is a stimulus and there is a conditions stimulus and so on. Okay second, one of these ideas which I find prominent in cognitive psychology is called pattern recognition. This is one of the processes that cognitive psychologists believe is possible for human beings of recognition of patterns and that makes possible there in all their recognition of various stimulus and the environment that are patterned whether they are leaves or human faces or signatures or whatever. Then the notion of short term memory very important thing and there's been a lot of research that done in cognitive psychology to indicate that short term memory is a very limited affair. It is limited in terms of time that the memory lasts but particularly it's limited in terms of its capacity, in terms of the number of ideas, the number of rules or whatever, one can keep in mind at once. So you know we started with the notion of seven plus or minus two but now that' seven has got whittled down to maybe three or four, that has an important thing to say for instruction. Then the working memory which is also one of the functions really of short term memory is as a working. The working memory is the part of memory that sometimes called the conscious memory or I sometimes referred to it as the forefront of memory where you know the things that are being learned a new or the things that are being put together from previous learning and new learning that takes place in the working memory. Some work is being done there and that's an important idea. Again this is related to the all business of the capacity, you know the limitations on how many of these things we can consider at any one time. Then there's a notion about long-term storage. In fact that is different after all from short term memory that is what we aim for in learning. We aim to have things stored in a long-term sense and what's the nature of long term storage. Well fundamentally you have to say first of all it is organized. It is not lists, it's not stimulus-response associations per say, that's not enough,it is organized, more than that. Now there's been a lot written about being organized course they're talking about declarative knowledge particularly in terms of propositions. Propositions have a subject and a predicate, you see. They are sentence like things, they are not just associations, they are sentence like things, and that means they have an inherent organization to start with. That's one of the what I call then I'd

say that's one of the fundamental axioms of cognitive psychology that the long-term memory is composed of these things which have the form of sentences or propositions. There are other kinds of organization in this long term memory and we've already mentioned one of the proposals that one of them is the schema. A schema the general concept that includes a lot of the related and subordinate concepts within it and that has the kind of a structure that makes it possible for new things to be inserted in slots or how do you want to call them. Alright finally the last thing I'll mention is the notion of executive control. This is an early thought of cognitive learning theories that besides of all of the processes of learning some of which I have mentioned already, there are also executive control processes. The learner himself uses these processes to in some degree influence or control is all learning. And these of course are very important.That is come from cognitive psychology and I think there that each one of them has some role to play in the design of instruction and needs to be taken into account in the design of instruction. Let me mention some of these. Now, what about the notion of information processing phases? Well that means that instructional design needs to make provision for the support of each of these phases of processing that go on in the human brain. And that means that you have to use different means for different purposes. If in fact you're concerned with the phase of pattern recognition, you do something about that has, that will support or enhance, or activate or it does something externally that will help the process of pattern recognition. On the other hand, if you are concerned with another phase of this process which is the encoding of something for storage in long-term memory, then you're concerned with designing some kind of instruction that will help the learner and code these things properly in a simple sense you know if he's learning two words such as boy and cow, you are telling the way to encode that's put it in the sentence that says the boy kick the cow, that will be easy to remember, that is encoding you see. Alright, second what about pattern recognition, what do you do about pattern recognition? You do something about pattern recognition, when you make the features of what is being presented of the presentation, shall I call it. When you make those things distinctive, you see, when you help the learner distinguish the features of what is being shown or what he is reading or whatever it is, then you are supporting that particular phase of information processing. One needs the third idea; one needs to stay within the capacity limits of short term memory, no question about that. If you try to present and let's give an example here if you try to burden the learner with sentences that are too long, then he loses the thread all of them, why because he loses them from the short term memory and he can't remember the first part of the sentence till he gets the last part. All of these things are important in a subject like reading for example as well as in writing. Another idea which I hope will say a little

more about later on too is you mentioned that before is to reduce the demands on attention, this has to do with working memory really. Reduce the demands on attention by atomization. If in fact the new reader has atomized the basic skill of decoding words, then he will not be hung up, when he is confronted with a whole sentence to have to read and understand. So, the idea of automatizing somethings in order to reduce the demands that are made on attention is a very important notion in designing instruction I think. Now what about encoding that I have mentioned before, what about storage in long-term memory? Well one needs to provide an organization in the presentation of the learning itself, one needs to provide an organization that makes the cues to retrieval readily available. We've really spoken about that already in a number of ways. What about to the executive control idea. Well that is cognitive strategies. When it is possible on needs to encourage the learner to acquire and use cognitive strategies, when they are appropriate to what he's doing or what else should I say. The organization of memory and the notion of the schema one should take advantage of pre-existing schemas these are the context for new learning. These are the highly organized, previously learned knowledge that the learner has to which he will relate at least if not subsume, he's new learning so all of these ideas from cognitive psychology I think have an implications for the design of instruction and that's mainly what I thought about this subject initially, let's see what they thought about then.

Merrill: Okay, I think a little different thing is obvious, and again I think the difference for the basic differences between this is intended stay empirically based and I tend to come down from the mountains with. Some time ago in teaching my classes at the university of Southern California it was where I was I started to get a lot of lessons in my instructional design class them to sample lessons and I gotta let lessons that were really kind a text book like and I started to look at these and I started to look at these and so I started ask my class the question where is the instruction, what's the purpose of instruction. If instructional design does something, what's different from writing a textbook and instructional designers writing textbook merely instructional design and is that all there is. Shouldn't there be something more, what is it that instruction tries to do to content information that's out there that makes a difference that facilitates learning. And it was kind of a question at the time and I don't have an answer but I just thought I'd throw out the students, but maybe they come up with it. This is a separate issue that threat to led to this. The other issue is for long long time, and I'm like Bob as if you've read his conditions of learning you know starts from the psychological literature and builds his argument. I just start out in the middle of a street corner built my argument with no bad foundation at all assuming that everybody knows what I know

about psychology that's obvious where these things came from, but I have learned over the years that's not at all obvious especially since now that we've separated psychology from instructional design and many instructional designers are never trained in psychology.

Gagné: Ohm…

Merrill: I know I have the same kind of feeling, but nevertheless the truck just stating but it is true. And consequently, it's hard to find you know they are there they just can't take these things as prescriptions and somehow they were given down and we use them. And anyway and thinking about this I came up with what I you know humbly call the cardinal principles of instruction and you have a list of these in your thing, but in order to talk about the cognitive psychology its relationship here, let me quickly review and I think of the cardinal principles and I think that touch other things just talked about. The first we have to start whenever you have principles, you need to start with an assumption. And the assumption is Bob's conditions assumption, there are different kinds of learned performance or instructional outcomes, different instructional conditions are necessary to adequately promote a given type of learned performance and that's not a direct quote but its I think certainly consistent with the things you have said since 1965. However, the next two sentences are slight extension and that is that I would like to further hypothesize, this is an assumption still, that there are different types of cognitive structure associated with these different kinds of learned performance. Now what this is saying and I think that's very consistent with your opening remarks that the reason for different conditions because of different ways to represent it. So maybe I should slip your name down below that one.

Gagné: Not necessarily but I haven't emphasized that way before but I think that is true, I agree entirely, yes.

Merrill: The next part is a little tricky and that is that there are different types of cognitive processes necessary to use each type of cognitive structure to achieve a given type of learned performance. Now the last items probably require some explanation.If in fact we see these cognitive structures as various types of organization on the declarative network of information that a student has in their head, then I would argue that in order to paraphrase or seek out a piece of information that may be not just you know response to a stimulus, but whenever I have to traverse that network in some way, there are various ways to do that, and that those purse processes which may be

conscious or unconscious but let's do it just conscious one for a minute, that process of kind a traversing that network to try to extract the information or answer the question or make the inference also corresponds to the type outcome. So I'm arguingthat there's two things here a cognitive structure and a process on that structure, and now if you go back to that matrix we had up earlier, if I could find, this one, then I would argue that these represent various kinds of content structures which have some correspondence to cognitive structure. I am not saying these are what is the head and these represent the various cognitive structures various kinds of declarative, procedural and cognitive strategy structures that I'm arguing that in each of these cells, one of the things we could put in there would be what is that structure and suggesting that these all these different kinds of declarative knowledge, different kinds of procedural, and what's the process that's most appropriate for traversing, interacting with using that structure in order to solve a given problem and that's what's intended by this assumption. Now clearly an assumption is a given we are saying Okay that's the assumption we're starting from, if the assumptions wrong the rest this might fall apart, but given that assumption, then what we try to do was to develop some principles to answer the question, what's the purpose of instruction, what's an instruction supposed to do, what are we suppose to accomplish, and get away from the things this is well, instructions suppose teach somebody to do something, want to be more profound than that, or maybe not but anyway. So the first cardinal principle is what we call the cognitive structure principal, which suggests that the first purpose of instruction is to promote the development of that cognitive structure which is most consistent with the desired learned performance. All right, now I mean, don't think that's inconsistent at all what Bob was saying this morning that if you have different conditions, different kinds of outcomes, the purpose of instructions is to promote the development of a structure that's we can use to perform that outcome, so that's what that's.

Gagné: It is however a new definition of condition. Because it says you know the purpose here is to develop something internally, you have to say what that is. You said that's a cognitive structure, not to develop something that makes possible performance. We're now saying what is that something, cognitive structure, that's new.

Merrill: Yes, that's my attempted related to cognitive psychology.

Gagné: That is new to you isn't it.

Merrill: Yes, well you know fairly reasons, the last few months no few weeks, years. Okay.

Gagné: I think it's an important idea I want to be sure we make the point that that's to be contrasted with the notion that the purpose of instruction is to achieve some objective, that objective of being a performance. All right!

Merrill: Good point!

Gagné: You are saying that may be true, but really what we're doing years to establish a cognitive structure, which will achieve.

Merrill: That's right, in order to get the performance we have to have the appropriate cognitive structure and that's what we're saying. It's clearly a cognitive psychology point of view as opposed to a behaviorist point of view in this particular thing. All right the second cardinal principle it seems to me is that the purpose of instruction is to promote incremental elaboration of that cognitive structure. Now this is the notion that cognitive structures aren't born you know full-blown that you establish an embryo of a structure and that these things change over time and that part of instruction is to get what's already there and elaborated again where the important principals from cognitive psychology to elaborate these structures to promote the incremental elaboration of the most appropriate cognitive structure to enable the student to achieve the desired generality in complexity in the desired performance. This is an acknowledgement that learning is a continuous kind of thing that in most at least complex performances it's not all or nothing you're not either there not you might know something about this but that incrementally you can build the structure to encompass more and more complex things and eventually to interrelate with other structures and so forth, and that this needs to be an incremental process and promoting that incremental process is one of the major purposes of instruction. And now Bob you know we have talked about learner guidance, now I want to try to be really precise about learner guidance. Okay it seems to be the learner guidance principle in general says the purpose of instruction is to promote that active cognitive processing. Now again we have talked about process and structure that active cognitive processing which best enables the student to use the most appropriate cognitive structure in a way consistent with the desired learned performance. The whole purpose of guidance is to get the neurons to fire inside the head as it traverses one of these structures in a way that enables the student to do what it as we wanted to do and

guidance is how do we do that and so I've suggested two corollaries of ways to do that. Corollary number one says the purpose of instruction is to promote the best use, some of my students have argued with me on the best use but I still use it, of the most appropriate cognitive structure by guiding the student through the most appropriate cognitive processing for that structure. This is usually accomplished by actually doing some of the processing for the student. Now that's a strange phrase you can't get inside the head and do the processing but what you can do is to solve a problem step-by-step which fires of the processing for the student and we all see that in instruction, so you know I do it for them, my kids come to have me help them do homework and the two often what I do is hard to help them. So that what I do for them, well watch I will solve this problem, what I should do more accurately is to say well do you know how to do the first step you know try this, let me show you, oh yes okay, now you do what, okay now what's the next step and so forth. In other words, I'm trying to get them to do what it is and I provide lots of guidance up front. Now that the last phrase of it, this is very important, because I'm usually accomplished by doing some of these processing for the student but also by requiring the student to do more of the processing because instruction does less as the instruction progresses. This is what earlier we call the fading principle but fading is much too narrow over term, I do not like the term at all but this is the idea of transferal of the processing so early on the instruction does it but later on we're getting the student to do more of it, and eventually, the instructor withdraws in the students doing it, and that's what we mean by guidance, at least that's corollary number one of guidance.

Gagné: In the bad old days, it used to be called prompting and fading.

Merrill: Yeah, that's why say but I think prompting and fading was not enough. I mean was too narrow but I agree there is nothing new under the sun, these are you know this is program and instruction revisited. Second corollary the first party says the same thing but the second corollary says that the purpose of instruction focus attention on the relevant parts to the information provide, this is what bob was talking about and making the Q's distinctive, so forth. This is exactly relates to that, so the second part of guidance is to focus attention on the relevant parts to the information providing, showing how it's related to the cognitive structure process but also again that withdrawal by requiring the student to do more self-directed attention focusing quality instruction does less as the instruction progresses, so it seems to me not I hope you see a distinction here, one we're trying to help them focus in on what part of the information relevant to use the other part we're trying to leave them through the processing they

have to do in order to do this and those are the two aspects of guidance. The final cardinal principle, it seems to me is the practice principal which really relates to the whole question of automaticity, and that is the purpose of instruction is provide the dynamic and I want to come back that wait a minute, ongoing opportunity for monitor practice that requires the student to demonstrate the desire to learn performance or a close approximation of it while the instruction monitors the activity and intervenes with feedback both to result in process. There are some implications in here that that are hidden in some of these words. I think a lot of what's termed practice especially in school type learning is not practice at all, answering I mean I think of traditional computer-based instruction where we provide some text and then ask questions and often asking questions is only with the discussion we had earlier is only tangentially related to any performance. I think we have the tools now with video discs and computers and that's part of what we want to talk about in this session. Creative kinds of practice opportunities a lot more simulation, a lot more experiential environments in which the student is doing more of the kind of thing that they would be doing and that the instruction or the instructional system can monitor that practice. We all know that some of the best instruction it goes on out on the football field or before the football game. Anybody in physical education or especially in competitive sports knows that where you really get that as you get a coach who stands, watches that tied and perform every single move and provides all kinds of feedback. And we know that's necessary in motor performance. I would argue that same kind of coaching is necessary in intellectual performance, but we often don't get it, we almost never get it, but the technologies appropriate now that we can provide more of that than we ever could before and that's one the great advantages of the technology and that's what this principle is all about is that we need to get closer and closer of the performance in order to build that atomicity. Now the reason for suggesting these cardinal principles is I like to kind a have a framework which the tie a discussion of cognitive psychology and some other things that Bob suggested I think fit directly into this but I wanted to try to put it in the context of what are we trying to accomplish here overall. Now I do think there are some new ideas here. I think the idea of organizing content in the content structures with a hope or the belief that teaching the student those structures or using those structures to teach the student will develop a parallel or appropriate cognitive structure is a relatively new idea in instruction. I mean may not be but I think that's one of the implications here and have some real implications for how instructional design theory might perceive the future. A second comment I would make here is that the notion of promoting cognitive process to interact with that structure and that the purpose of instructions to help carry through that process is also a relatively new way

of looking at the little different way, looking at instruction and has some implications. I think this also has implications for cognitive psychology this is not derived entirely from cognitive psychology. If you take cognitive psychologist and the distinction between procedural and declarative knowledge essentially one of the strong implications here is we think we can identify some general, organizational patterns which can be used to promote the development of these cognitive structures and that whereas psychologist tends to look at the world kind of from what happens when people learn I think is an instructor or instructional theorist were more interested in looking at the world from is that what happened we make that learning take place more efficiently more effectively more quickly and that were interested not an observing what kinds of patterns emerge after learning but how can we deliberately promote those patterns. If in fact the assumptions of we have made those patterns are necessary, are appropriate. I say one more comment and that's on the notion of schemas and idiosyncratic organization versus what we're talking about here in terms of content structure, content organization. I guess as I was trying to draw pictures but it was worth showing it seems to me that one dimension of this might be idiosyncratic or social structures that we all share or that an individual might have their unique to them, for example we have talked about the restaurant structure, buying a ticket, the train station structure or the story structure, there's as people grow up in a common culture they develop these kinds of schemas and it seems to me these are kind of content specific but I would argue that we're really lucky a little different dimension saying that these content specific schemas shares some characteristics of content organization which are appropriate to different kinds of outcomes in that it isn't the completely idiosyncratic orientation that if we can figure out what kind a general characteristics of these structures are they would then back up to these categories of outcome and provide for us a limited set of guidelines for instructional design. I do not know what I've said but that's all I have to say.

Gagné: Sounded good. Well, I think I can relate most of things I talked about to your categories here or to your kind a principals here. Let me say taking that first one there, you say I then like most of what you say there but there is one sentence that I don't know that I agree with it. The sentence is there are different types of cognitive processes necessary to use each type of cognitive structure to achieve a given type of learned performance. No I don't think that, I don't like that. That's not right.

Merrill: I have word use comes in again, doesn't it.

Gagné: I don't think that's, no see, I would say, I would not be talking about that, not using a given type of learned performance I think there are different types of well I would not rather say there are different types of processing that take place during the course of time that a learning event is a occurring. Now this idea is not shared by all cognitive psychologists. Actually it comes originally from, who haven't, what the name, Atkinson and Shiffrin. They proposed a model of cognitive processing, and information-processing model which actually had phases in it or stages if you want beginning of course with the very brief registration that occurs what they called it century registers and from then on now these things occurred in sequence you see. So I tend to follow their model which I like although it's not the only one, there are others who don't agree with it, probably not at all but I do. And they said look there are several kinds of information processing that take place. There is first of all the registration of the stimulation in the century registers, okay fine. What else, well from there, there is something that make some initial kind of processing of this raw information into objects, characteristics and so on, in other words something that deals with these in terms of features and it's not in this a new idea. People used to call that perception; what the computer people call it pattern recognition which is fine that's what perception is, recognition of a pattern and that is what happens next and it is depended upon the processing of the features of what is being looked at. Now you see perception is an early-stage of learning, you have to perceive what is being presented before you can do anything call learning but it is a part of a total active learning, so what I would like to talk about you see is the processes that go on as far as I'm concerned sequentially has one tackles a new learning task. First we're leaving out century register because that's not very important but first is, I'm looking at the Bible here.

Merrill: I have mine out here.

Gagné: And I have that in my book, you see. First the selective perception of features then what about short term memory well something has to be done to get this in the short term memory I am there have been research on this subject. Now I'm not sure what we know all the answers to this but certainly, it has to be, no it can be it can be chant you see can be abbreviated in various ways in order to get into short term memory without exceeding the capacity that memory has. Then having been in short term memory there's a next stage, it goes to long-term memory. This is the Atkinson Shiffrin theory, you see. It goes to a long-term memory, but there's then another kind of processing that takes place, and that is called semantic encoding and I have mentioned

that how things are supposed to be stored fundamentally in long-term memory and you know I don't know this is the whole answer but I like the answer you see things have to be semantically encoded before they can get into long-term memory or before they can be stored in long-term memory in any general sense. Alright then there is you know then you have to deal with the process retrieval. Suppose you do have something that's been previously learned and it needs to be combined in some way or other with some new learning, it has to be retrieved as be searched for and retrieved. Alright, now I won't go into any more detail here except to say my assumption is that learning is composed of every one of those of information processing. And not all the same, selective perception is not at all the same as semantic encoding, you know and that is not at all the same as retrieval and neither of these are the same as storage and chunking in short term memory. These are different kinds information processing. Now my view is that each one of these processes needs to be taken into account and supported in some way when we design instruction. So you see, I would make a last sentence which it wasn't about this process at all, I would make lessons would say there are different types of information processing and therefore there are different types of external support needed to enhance or to facilitate each one of these processes involved in learning.

Merrill: Excellent!

Gagné: Now, that's a different point.

Merrill: It is a different point of view. As a different boy, it is a different point. It really depends a lot where you stand, doesn't it. Let me, I've drawn the definitive interpretation.

Gagné: Ohm, fine.

Merrill: I think we're talking about different things in a sense and I have no quarrel with what you're just saying and in fact it probably is on a mission.

Gagné: I realize is different you say.

Merrill: But I don't think inconsistent. I tried to identify here two sets of processes. What have you been talking about are the learning events and I've not represent them very adequately, but the learning events have sensation and perception and encoding

and so forth and you're saying that as you are youth in events of instruction that in the acquisition process that we need to attend to each of these events and I have no quarrel with that. But that's not what I'm talking about here what I'm arguing really is the process talked about here the cognitive process talked about the cardinal principles is the outcome of this acquisition process. So I would argue that there's some acquisition processes and I agree we need to attend to those. I like the events of instruction. And then I think that there are some performance processes which is part of what stored. So in addition to the structure I guess I'm really arguing that associated with the structure is a process for traversing that structure in performance in order to get the retrieval or in order to get the performance that we want. So part of what has to be acquired is not just the structure but is the process for doing that structure. Now at the top level, the general process is what we call cognitive strategies but I'm arguing that even below that...

Gagne: You want it to teach for transfer.

Merrill: Well yeah but I think at the declarative knowledge level. You may not be teaching for transfer but I would still argue that there's a process for traversing the network in order to make an inference and now maybe that's a cognitive strategy, I mean may be these are you know all join together and that we you know that we always are teaching cognitive strategies and maybe instead of that there's a separate category and overlays the other two all the time. I mean that's a possible way of conceptualizing this I suppose. But I'm really arguing I have no quarrel at all with the acquisition processes, but I'm really saying that what stored what is learned is a performance process as well as a cognitive structure and that when we execute that part of the job of the cognitive strategy is to decide which performance process do I applied to the structure. Now there's also another implication in that and that is, there's not just one to one relationship otherwise why make the distinction that I could use different structures to different processes to traverse the same structure, and I would result in different outcomes.

Gagné: Well it get to a little abstract.

Merrill: Certainly that.

Gagné: But I see what you mean.

Merrill: It was the generally movie promise pictures this afternoon I am going to show those in a minute of the schema.

Gagné: Alright, it is an idea perfectly reasonable idea, you know, right! I think it's abstract at the moment. And so I can't react to it any more than that. I think it is reasonable though. I ask hard questions. How would you show such a process is necessary? Well no answer, mean, think about that.

Merrill: Well I am trying to decide what level to answer I mean there's one implication of that question is you know what kind experimental demonstration separate that out and I'm not sure that I have thought about that sufficiently if you try to answer in that way. You know I guess I really am kind of a thinner theorist in a way that I like to think about these things and then say what if. On a practical level, however, I think I am kind an instructional design practical level. It's possible to think about some of these things, for example let me just try something very general. If we take a kind of a kinds of taxonomy so I have thought all about that, now I think we all know that concepts are organized in kind of kinds of ways and yet it's very infrequently we teach those structures to students accepted a single-level. We may say there are three kinds of but we don't bother to show how this taxonomy fits into a giant more broad world's scheme, social scheme and so forth. Now, what is the other, there's a lot of implications of that kind of a structure. One of the implications is that nodes lower in a kind of structure inherit all of the characteristics of higher nodes in that structure, and I think you know, if somebody's dealt with knowledge knows that but the average learner probably hasn't thought much about that, but if I teach that as an implication and then I teach a very large network of concepts. Then I've given the student a process by which they can traverse that network and make inferences which they may not be able to make otherwise. In other words I think that cognitive psychologist talk about these is kind a learning processes that go on, and I'm saying why not pull those out, make those part of the instruction, lead the student through such a network in terms of making inferences using the assumption of inherited characteristics. And that becomes a kind a process that I'm talking about. Now, there are other processes that can be applied to the kinds of kind a network. But I guess the idea here is that if we start thinking about instruction from that kind of a detailed level, there's some other really strong implications of this; for example if you take a network of ideas and you start to instantiate nested networks let's say I take kinds of and I am trying to think of an example now, let's take a kinds of birds and so we take we say okay we have birds are prey and seabirds I do not know if it is a good category and so forth but we can start

with that. Now, at that level I have a very simple taxonomy and doesn't tell me much, but I could start to say all right I'm going to now backed that up with properties of, what are the properties of a seabird, what are the properties of a birds of prey. Okay, so I can say okay the property of birds of prey is that they have claw like feet and sea birds have web feed and that birds of prey have really good eyesight and so forth. I could start to itemize all these properties. I could also instantiate this further by saying I'm going to instantiate with some examples which might even be images for the student. And I start to instantiate this. Now, the content structure external I can build this giant network. Once have got that network built I can derive from that network the definitions of a sea bird or bird of prey, I don't need any more information, I don't have to write a separate definition, because if I have the properties of and I know what the property of a bird is and I know that if it node is below that like a sea bird inherits those properties, then I know that a definition I can use a computer program to derive that definition. But once the student has learned that structure so can the student, so one of the other things that I could teach a student as a process is give me a definition of a seabird and no matter where the student enters if he's got this network he can move up figure out what the attributes are even by looking examples and extract the definition and he no longer has to say I memorize the definition, we now have time him to process for traversing a cognitive structure in order to derive the definition. The same thing is true of objectives from an instructional point of view. Instead of write I have a content structure worked out; the objectives followed from the content structure that as I can derive with a computer program, the objectives that are possible on that structure with given certain processes. So what I'm really trying to deal with is that we can identify what some of these processes. Are you all lost? The three people are still with it. We can identify let some of those processes are and we can teach those directly and that it seems to me that's kind of the new goal for instruction as it relates to the cognitive psychology. I guess it kind of an extreme thing to say is if an adequate job of knowledge acquisition then I have enough information to create the instruction without further intervention on the part of an instructional design. That is pretty rare.

Gagné: Well you're giving advance ideas here.

Merrill: That's what this was all about if people want to come here in the future.

Gagné: Yes that is fine, you know think these are things that take a lot of work to work them out, to formulate them even add to do the kind of studies on instruction and learning that will give some verification. So I mean I think that quite reasonable.

Merrill: I think it is time for the questions.

References

https://archive.org/details/ConvInstDesign. retrived on 14.November, 2016.